

BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1938 ROYAL BOTANIC GARDENS, KEW

LV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXXVII.*

NOTES ON THE FLORA OF TOBAGO. N. Y. SANDWITH.

At the time of the publication by Urban in 1902 of a list of botanical collectors in Tobago (see *Symb. Ant.* 3, 157), the name of the Baron von Eggers stood out in lonely prominence as that of the first serious investigator of the flora of this island. His collections of about 510 numbers were widely distributed and there is an almost complete representation in the Kew Herbarium. Since 1902 the island has been much better explored and the flora of all regions except that of the Forest Reserve of the Main Ridge may now be regarded as comparatively well-known. This is due to the efforts of that energetic collector the late Mr. W. E. Broadway, who was for some time resident in the island as Curator of the Botanic Station, and paid subsequent visits to it almost up to the date of his death in January 1935. From the evidence of his registers of field-notes, now preserved at Kew, it appears that Broadway's collections in Tobago, extending over a period between August 1908 and December 1933, reached a total of some 1122 numbers. Of these very many, it is to be regretted, are not represented either at Kew or at the British Museum; the great majority was sent to Berlin where it was thoroughly studied by Professor Urban and was found to contain a fair number of good new species which are apparently endemic. Very useful collecting in Tobago has also been done by Professor E. E. Cheesman, and Messrs. R. O. Williams and W. G. Freeman, whenever they have had occasion to visit the island, with the particular object of obtaining additional records and materials for the Flora of Trinidad and Tobago.

During October 1937 the writer, accompanied by Dr. John Smart of the Department of Entomology, British Museum, stayed for three weeks on Tobago and collected about 325 numbers, with duplicates, for the Kew Herbarium. They were joined for about four days by Prof. E. E. Cheesman who was collecting fresh material of *Cucurbitaceae* and *Compositae* for descriptions for the Flora of Trinidad and Tobago. The season, a "wet" one without rain, was unusually hot and oppressive, and the month was unfavourable for the flowering of trees in the high virgin forests. Nevertheless,

* Continued from K.B. 1938, 294.

excursions were made from Bacolet to most parts of the island, the Main Ridge was crossed or entered on several occasions, and four days were spent in the Parlatuvier neighbourhood on the remote and roadless north side. Now that the collection has been worked out the impression gained is that there is a great deal more work to be done in what is, obviously, the most interesting and important region in the island, the Forest Reserve of the Main Ridge. This is particularly true of the northern slopes above Parlatuvier and towards Pigeon Hill, which have a heavy rainfall. It is quite evident that repeated exploration of these forests will add many new trees, herbs and ferns to the known flora of the island, and among them there will be some good new species. The present difficulty is that very few public "roads" cross the Main Ridge, there is only a limited number of paths entering the virgin forests from the higher cacao areas of the estates, and there are no Government resthouses on the Ridge itself. Again, material of many of the larger trees will never be collected until they are felled.

In spite of the low altitude of the Main Ridge—the highest point is 1890 ft.—the flora of these forests is obviously of great interest from the standpoint of distribution. It resembles that of the Northern Range of Trinidad, but some species evidently belong to a Lesser Antilles flora, while others (e.g., *Tresanthera*) represent a Venezuelan element which apparently does not reach Trinidad. There are also several supposed endemics, some of them, for instance *Tobagoa* and *Besleria Seitzii*, remarkably distinct and quite frequent. The dry thickets on the coast slopes of the southern side of the island have another very characteristic type of vegetation, some of the species (e.g., *Daphnopsis caribaea*), being widely distributed in the Antilles and on the islands or the coast of Venezuela, but rare or unknown on the mainland of Trinidad where such ground is less often met with. Apart from these two types the island is mainly cultivated, but interesting species are still to be found on coast rocks, along shady gullies, by rivers, and on the steep slopes of valleys in the low-lying populated districts.

The object of the following enumeration—which omits many very common species—is to indicate first records for the island and also records which were omitted from those parts of the Flora of Trinidad and Tobago which have been published; while a number of observations on the taxonomy or nomenclature of species is included. Two new species are described. The writer's thanks are due to the following botanists who have assisted him with the identification of certain families: Dr. S. F. Blake (*Compositae*), Dr. E. P. Killip (*Urticaceae*), Mr. V. S. Summerhayes (*Orchidaceae*), Mr. C. E. Hubbard and Mrs. Agnes Chase (*Gramineae*), and Mr. A. H. G. Alston (*Pteridophyta*).

The following abbreviation and symbols are used:
Fl. The Flora of Trinidad and Tobago, now in course of publication.

* Indicates first published record for Tobago.

† Indicates that the record existed but was omitted from the Flora of Trinidad and Tobago.

RANUNCULACEAE.

Clematis caracasana DC.

By Easterfield Road, two miles from Mason Hall, very local, Oct. 19th, S. 1867. Climbing over trees. Hairs of fruit greyish-white. Also seen in one spot by the Parlatuvier-Roxborough road.

ANNONACEAE.

Duguetia tobagensis (Urb.) R.E. Fr. *Alcmene tobagensis* Urb.; Fl., 1, part 1, p. 18.

Great Dog River, in virgin forest on river-bank, Oct. 12th, S. 1739; a small tree with cream-coloured flowers. An additional locality is Menna Road, Lot 42, *Broadway* 8926.

For the reduction of *Alcmene* to *Duguetia* see R. E. Fries in *Acta Horti Bergiani*, Band 12, 1, pp. 92-94 (1934).

CAPPARIDACEAE.

Capparis flexuosa L.

Store Bay, on coral cliffs, Oct. 17th, S. 1950.

***Cleome aculeata** L.

Bacolet, grassy side of Friendsfield Road, Oct. 17th, S. 1815. Erect herb with unarmed petioles and white petals.

FLACOURTIACEAE.

Casearia spinescens (Sw.) Griseb.

Bacolet, frequent on dry wooded hillside, Oct. 6th, S. 1634. Shrub or small tree with spinous twigs. Flowers white. Fruit green, warty.

C. sylvestris Sw.

Lambeau Hill, c. 700 ft., Oct. 7th, S. 1644. A small tree with cream-coloured flowers.

CARYOPHYLLACEAE.

***Drymaria cordata** (L.) Willd.

Mount St. George-Castara road, grassy side of track in virgin forest, Oct. 18th, S. 1835.

GUTTIFERAE.

Clusia minor L.

Sandy River Valley, bushy bank, Oct. 9th, S. 1681. Small tree, 20-30 ft. high. Corolla pure white.

***Marila grandiflora** Griseb.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, plentiful from 6½-8½ mileposts, usually by streams and on the edges of ravines, c. 1200-1500 ft., fl. Oct. 25th, S. 1928. A small tree up to about 30 ft. high; branchlets brown, flattened; petals snow-white, reflexed.

Hitherto regarded as an endemic of the Northern Range in Trinidad.

MARCGRAVIACEAE.

Marcgravia tobagensis Urb.

Mount St. George-Castara road, creeping and climbing up trees in forest reserve of Main Ridge, c. 1200 ft., Oct. 18th, S. 1855. Flowers and pitchers green. Ripe fruit red.

THEACEAE.

Ternstroemia oligostemon Krug et Urb.

Slopes of Main Ridge above Parlatuvier, in a patch of relict forest on borders of cultivations, fl. and fr. Oct. 24th, S. 1916. A middle-sized tree with white flowers.

MALVACEAE.

Malvastrum coromandelianum (L.) Garcke.

Store Bay, on roadside, Oct. 17th, S. 1817; erect herb with yellow flowers.

Sida acuta Burm., auct. amer.

Store Bay, bare waste ground near cliffs, Oct. 17th, S. 1822. A low shrub with woody stem. Petals yellow.

Agrees with authentic specimens of *S. antillensis* Urb., which is treated as a form of the variable *S. acuta* by Britton and Wilson. The habit, the shape and indumentum of the leaves, and the very short (about 0.75 mm.) awns of the carpels give these specimens a distinct facies.

†**S. glomerata** Cav.

Store Bay, bare waste ground near cliffs, Oct. 17th, S. 1823; leaves yellowish-green; petals very pale creamy-white. Milford Main Road, Oct. 1925, *Freeman and Williams* in *Herb. Trin.* 11454. Near Crown Point, 1912, *Broadway* 4240, det. Urban (fide *Broadway's* Register). Recorded from Tobago by Urban, *Symb. Ant.* 8, 415.

S. linifolia Juss.

Bacolet, dry grassy hillside, Oct. 21st, S. 1875.

†**Pavonia fruticosa** (Mill.) Fawc. et Rendle.

Parlatuvier, locally plentiful on rocky shady bank, Oct. 22nd, S. 1885. Petals very pale pinkish-white.

Recorded from Tobago by Urban (as *P. Typhalaea* (L.) Cav., in *Symb. Ant.* 8, 422), no doubt on the strength of *Broadway* 4458, from Lot 42, April 1913.

STERCULIACEAE.

†**Waltheria americana** L.

Bacolet, bare ground on edge of dry scrub, Oct. 20th, S. 1872.

Recorded by Urban, *Symb. Ant.* 8, 431, presumably on the strength of *Broadway* 4770, from Scarborough, see *Broadway's* Register.

Corchorus aestuans L.

Near Bacolet, grassy side of Friendsfield Road, Oct. 17th, S. 1814. Store Bay, bare ground on coral cliffs, Oct. 17th, S. 1828. Prostrate herb with small bright yellow flowers.

No local specimen had been seen when the account of the *Tiliaceae* appeared in the Flora. Confirms the Tobago record in Urb. Symb. Ant. 8, 406.

Apeiba Schomburgkii Szyszyl. A. Tibourbou Aubl. var. membranacea Lockh.

Bacolet, in thickets on dry hills, Oct. 21st, S. 1874. Tree, about 30–40 ft. high. Sepals very pale brown. Petals white.

Restored to specific rank by Uittien in Rec. Trav. Bot. Néerl. 32, 249 (1935).

Muntingia Calabura L.

Castara, roadside on slopes above village towards Moriah, c. 700 ft., Oct. 18th, S. 1830.

ERYTHROXYLACEAE.

***Erythroxylum cumanense H.B.K. E. ovatum Cav. var. splendens O. E. Schulz?**

Buccoo Bay, on sandy promontory with species of the Mangrove association, Oct. 8th, S. 1667. A small tree with spreading twiggy branches, about 6–8 ft. high, and as much or more in breadth. Corolla cream.

The writer cannot distinguish this material specifically from specimens from Margarita and Guiana which Schulz compared with the authentic sheets of *E. cumanense*, and it agrees well with the original description of that species. The habit (horizontal branches and branchlets) and the very short pedicels distinguish the plant from the West Indian *E. ovatum*, and the habitat and considerations of distribution are favourable to the identification with *E. cumanense*. A specimen from Cedros, Trinidad, coll. *Crueger*, is possibly the same plant. It is possible that this material may be identified with *E. ovatum* var. *splendens* O. E. Schulz, which was unfortunately omitted from the Flora (vol. 1, part 2), although it was based partly on a specimen from Tobago (*Eggers* 5675).

MALPIGHIACEAE.

†Heteropteris macrostachya Juss. Banisteria apiculata (Miq.) C. B. Robinson.

Mason Hall, on cliffs of waterfall in Courland River, Oct. 19th, S. 1860; flowers pale yellow. Frenchfield, in woods, *Eggers* 5536. The Widow, *Broadway* 5895.

Recorded from Tobago by Niedenzu, in Engl. Pflanzenreich, 4, 141, p. 343 (1928).

Tetrapteris discolor (G. F. W. Mey.) DC.

Mount St. George-Castara road, in forest, Oct. 18th, S. 1841.

SIMAROUBACEAE.

Picramnia pentandra Sw.

Ascent of Pigeon Hill, c. 800 ft., fr. Oct. 16th, S. 1811. A small tree with reddish-brown fruit.

BURSERACEAE.

†**Bursera Simaruba** (L.) Sarg.

Bacolet Point, fr. Oct. 10th, S. 1704. A small tree in dense thickets on dry coast slopes. Fruit reddish-brown.

Recorded from Tobago by Urban in Symb. Ant. 8, 329, no doubt on the strength of *Broadway* 3497, from Chelsea, near Scarborough, April 1910.

HIPPOCRATEACEAE.

Hippocratea volubilis L.

Green Hill, on rocks in the river-bed, Oct. 11th, S. 1708. Bloody Bay, trailing on sandy shore in coconut thicket, Oct. 23rd, S. 1890.

***Salacia sphaerocarpa** Rusby, Descr. 300 new species S. Amer. pl., p. 52 (1920).

Parlatuvier, in virgin forest on slopes of Main Ridge, fl. Oct. 24th, S. 1910. A small tree, growing in deep shade. Flowers yellow, turning brown.

An addition to the Flora. The material agrees excellently in characters both of foliage and inflorescence with that of the type collections from the Orinoco Delta, Venezuela. Rusby did not describe the flowers of his species, but they are present on the Kew specimen of his no. 416, and dissection shows agreement with those of the Tobago plant. The inflorescence is up to 3 cm. in length; the sepals semiorbicular, lacerate-fringed, about 0.8 mm. long and 1.3 mm. broad; the petals obovate-oblong, nearly 2 mm. long, about 1.3 mm. broad. The species has the characteristic disk, ovary and stigma of Miers' genus *Kippistia* and falls into the first section of Peyritsch's account of the genus in Mart. Fl. Bras. 11, pars i (1878). *S. granulata*, a Tobago endemic described by Urban, has completely different foliage and was referred by its author to another section of the genus on account of characters of the flower. The affinity of *S. sphaerocarpa* is with the Brazilian *S. cognata* (Miers) Peyr.

RHAMNACEAE.

Gouania polygama (Jacq.) Urb.

Ascent of Pigeon Hill, c. 800 ft., Oct. 16th, S. 1810. Climber over low trees; flowers creamy-yellow.

SAPINDACEAE.

Paullinia excisa Radlk.

Castara-Parlatuvier road, $1\frac{1}{2}$ miles from Castara, Oct. 22nd, fl. and fr., S. 1879. Climber over thicket on bank by path. Corolla cream. Fruit reddish-brown.

A Tobago endemic, hitherto known only from the fruiting type collection (*Eggers* 5723), which was gathered by Bacolet River. The above collection bears flowers which may now be described as follows : flowers about 8 mm. in diameter when expanded ; 2 outer sepals very much smaller, ovate-orbicular, 2.25 mm. long, 2 mm. broad ; 3 inner sepals broadly obovate, 4.5 mm. long, 3 mm. broad ; petals rather narrowly obovate-spathulate, up to 4.5 mm. long, 2 mm. broad ; scales slightly exceeding half the length of the petals, those of the upper petals with a short obcordate crest which is somewhat shorter than the barbate inflexed appendage ; filaments flattened, about 2.5 mm. long, pilose near the base only ; torus and ovoid-oblong glands pilose.

LEGUMINOSAE.

***Teramnus labialis* Spreng.**

Store Bay, creeping over bushes on edge of cliffs, Oct. 17th, S. 1825. Flowers white.

***Clitoria rubiginosa* Juss.**

Bacolet, creeper in coconut plantation, Oct. 13th, S. 1754. Leaflets thick, more or less glaucous beneath. Corolla white ; standard with purplish stripes leaving the median vein within.

A glabrescent form, to be compared with *H. H. and G. W. Smith* 402 from St. Vincent, and sheets from Tropical Africa.

***Dioclea megacarpa* Rolfe.**

Bacolet, dry wooded hillsides, Oct. 6th, S. 1631. Corolla violet.

***Sophora occidentalis* L.** *S. tomentosa* L. according to Fl. vol. 1, part 4, p. 204.

Buccoo Bay, sandy promontory with Mangrove-swamp species, Oct. 8th, S. 1673. Small tree in thickets. Leaflets thick, dark green above, greyish below. Corolla rather pale yellow, recalling *Laburnum*.

The Trinidad and Tobago material is to be referred to this species, which is distinguished from *S. tomentosa* by the minute pubescence of the lower surface of the leaflets and calyx, the clothing on the leaflets being also much sparser.

***Cassia bacillaris* L.f.**

Easterfield Road, 2 miles from Mason Hall, small tree in bushy ground, Oct. 19th, S. 1869. Leaflets greyish-glaucous below. Petals yellowish-biscuit.

A small-flowered form, the petals reaching only 13 mm. in length, but otherwise indistinguishable from this species.

***C. patellaria* DC.**

French Hill, dry sides of track on slopes, Oct. 9th, S. 1697. Erect herb ; petals small, yellow.

***Brownea latifolia* Jacq., auct.**

Parlatuvier, dry bushy bank by track to Castara, Oct. 22nd, S. 1886. A small shrub with bright vermilion petals.

Entada polystachya (L.) DC.

Bacolet, dry wooded hillsides, Oct. 6th, S. 1622. Liane ; petals reddish-brown ; filaments cream.

Desmanthus depressus H. et B.

Bacolet, bare open ground, Oct. 15th, S. 1795. A small depressed shrublet ; filaments white.

Mimosa pudica L.

Bacolet, in dry coconut plantation, Oct. 5th, S. 1613.

Leucaena glauca (L.) Bth.

Buccoo Bay, in open ground on sandy promontory, Oct. 8th, S. 1669. A low shrub with cream-coloured petals and filaments, and pinkish-cream anthers.

Inga punctata Willd.

Mount St. George-Castara road, in forest reserve of Main Ridge, c. 1200 ft., Oct. 18th, S. 1848. A tree about 40 ft. high.

ROSACEAE.

***Hirtella triandra** Sw.

Great Dog River, Oct. 12th, S. 1737. A small tree on river-bank ; petals white ; filaments purplish.

H. silicea Griseb.

Caledonia, deep ravine by Easterfield Road, Oct. 11th, S. 1721. A small tree ; inflorescence with brownish hairs.

The fruit of this collection is softly scattered-pilose.

MYRTACEAE.

***Krugia ferruginea** (Poir.) Urb.

Roxborough-Parlatuvier road, 6th-7th mileposts, in Govt. Reserve Forest, 1400-1600 ft., Oct. 25th, S. 1929 ; a small tree, up to about 50 ft. high ; inflorescence pale brown. Menna Road, lot 42, April 1913, *Broadway* 4451 (det. Urban, fide Broadway's Register) and March 1914, *Broadway* 8932.

Calyptranthes sericea Griseb.

Bacolet, dry wooded hillside, Oct. 6th, S. 1624 ; a small tree. Other collections, not cited in the Flora, are *Broadway* 4056, Belmont, and *Broadway* 4864, The Widow.

Calyptranthes sp. nov.?

Roxborough-Parlatuvier road, in virgin forest of Main Ridge near 5th milepost, c. 1300 ft., Oct. 14th, S. 1769. A small tree, c. 30-40 ft. high. Buds and young fruit pale green.

The material does not agree with any species of the family recorded from Trinidad and Tobago, nor has it been matched at all. The inflorescences consist of buds and a single fruit. The splitting of two or three calyces suggests the genus *Calyptranthes*, but the general facies of the plant is perhaps more suggestive of *Marlierea*.

The large elliptic leaves, up to 20 cm. long and 11 cm. wide, the short clustered sericeous-pubescent axillary inflorescence-branches, and the small buds which are pubescent at the apex, mark an interesting plant which can scarcely be described on present evidence.

***Eugenia Cruegeri* Krug et Urb.**

Roxborough-Parlatuvier road, on slopes descending to Bloody Bay, Oct. 25th, S. 1920. A small shrub. Inflorescence and calyx very pale mauve with greenish tinge.

***E. monticola* (Sw.) DC. var. *latifolia* Krug et Urb.**

Bacolet, dry wooded hillsides, fr. Oct. 6th, S. 1630. Small tree or shrub. Berries yellow, then red, finally black.

MELASTOMACEAE.

****Platycentrum clidemioides* Naud.**

Roxborough-Parlatuvier road, c. 6th-7th mileposts, in reserve forest of Main Ridge, c. 1400 ft., Oct. 25th, S. 1930. Shrub or small tree. Inflorescence branches violet. Anthers yellow. Fruit pale greyish-purple.

****Conostegia icosandra* (Sw.) Urb.**

Roxborough-Parlatuvier road, in forest Reserve of Main Ridge, 8th-9th mileposts, c. 1200 ft., Oct. 25th, S. 1924. Large shrub or small tree; petals and filaments white.

****Miconia hypoleuca* (Bth.) Triana.**

Roxborough-Parlatuvier road, near 5th milepost, in forest reserve of Main Ridge, c. 1300 ft., Oct. 14th, S. 1771; shrub with brownish-orange fruits. Mount St. George-Castara road, Sept. 1927, *Williams in Herb. Trin.* 11808.

***M. laevigata* (L.) DC.**

French Hill, dry slopes, Oct. 9th., S. 1693. Shrub about 6 ft. high; petals and stamens snow-white.

***Clidemia hirta* (L.) D. Don.**

Above Bloody Bay, shady bank in cacao plantations by path to Charlotteville, Oct. 23rd, S. 1893. Low shrub with white petals.

var. ***elegans* (Aubl.) Griseb.**

Above Bloody Bay, with the typical plant, S. 1894.

The variety seemed so distinct in the field that it is desirable to call attention to it as an extreme form with broadly ovate, conspicuously cordate leaves which are deeply and irregularly crenate.

***C. pustulata* DC.**

Above Parlatuvier, dry slopes on edges of cultivation, Oct. 24th, S. 1917; a shrub with dirty white flowers.

****C. trinitensis* (Crueg.) Griseb.**

Roxborough-Parlatuvier road, in forest reserve of Main Ridge near 5th milepost, about 1300 ft., Oct. 14th, S. 1774. Shrub;

hypanthium reddish-brown ; petals 4, reflexed, dirty white. Forest reserve, 1911, *Broadway* 4000, det. Urban (fide Broadway's Register).

Hitherto known only as a rarely collected endemic of Trinidad.

***Henriettea multiflora** *Naud.*

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, near 5th milepost, 1300 ft., Oct. 14th, S. 1775. A small tree ; inflorescence galled.

LYTHRACEAE.

Cuphea denticulata *H.B.K.*

Lambeau Hill, roadside on edge of virgin forest, about 700 ft., Oct. 7th, S. 1665. Erect low shrub with pink petals.

C. setosa *Koehne* var. **glabrescens** *Koehne.*

Caledonia, on rocks in stream in ravine, Oct. 11th, S. 1730. Petals pinkish-purple.

BEGONIACEAE.

Begonia humilis *Ait.*

Caledonia, damp bank by stream in deep shady ravine, Oct. 11th, S. 1728. Flowers white. ♂ petals 2.

PASSIFLORACEAE.

Passiflora cyanea *Mast.*

French Hill, 750 ft., Oct. 9th, S. 1689. Roxborough-Parlatuvier road, by wooded slopes, 1st-2nd mileposts, Oct. 14th, S. 1760. Stems and petioles pruinose, purplish-glaucous. Leaves glaucous beneath. Petals white. Filaments amethyst.

Apparently not infrequent at low levels throughout the island.

P. laurifolia *L.*

Back Hill, above Charlotteville, Oct. 16th, S. 1798.

Not recorded from Tobago in Killip's monograph of the genus, but recorded by Urban, *Symb. Ant.* 8, 456.

P. tuberosa *Jacq.*

Slopes of Great Dog River valley, in cleared bushy ground on border of cacao plantations, Oct. 12th, S. 1744. Leaves with pores on lower surface. Corolla pale greenish-white. Stamens and staminodes with purplish blotches.

CUCURBITACEAE.

Melothria guadalupensis (*Spr.*) *Cogn.*

Back Hill, above Charlotteville, Oct. 7th, S. 1666.

Anguria umbrosa *H.B.K.*

Great Dog River valley, climbing over bushes by river, Oct. 12th, S. 1748. Corolla rich orange-brown.

Cayaponia racemosa (*Sw.*) *Cogn.*

French Hill, among bushes on dry open slopes, Oct. 9th, S. 1695 (♂ fls). Moriah, climbing over trees on roadside, Oct. 18th, S. 1829

(♂ and ♀). ♂ Corolla dark green, the lobes yellowish-white above and on the margins.

UMBELLIFERAE.

Eryngium foetidum L.

Great Dog River, in shade in cultivated land at lower end of valley, Oct. 12th, S. 1734.

RUBIACEAE.

†**Tresanthera pauciflora** K. Schum. ex Solereder in Bull. Herb. Boiss. **1**, 280 (1893); Standley in Field Mus. Publ. Bot. **8**, 158 (1930). *Rustia pauciflora* Solereder in Ber. Deutsch. Bot. Ges., ann. 1890, Generalvers. Heft, p. 99 in obs. (1890), nomen. *Tresanthera pauciflora* K. Schum. in Engl. et Prantl, Pflanzenfam. **4**, 4, p. 19 (1891), nomen.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, 800–1300 ft., Oct. 14th, S. 1757. Similarly on slopes above Parlatuvier, Oct. 24th, S. 1899. A shrub, 15–20 ft. high. Corolla greenish-white with purplish tinge. Morne d'Or, Cremorne River, 1200 ft., fl. Nov., Eggers 5812 (Munich, type. Kew. Field Museum, Chicago). Easterfield, fl. Dec. 1912, *Broadway* 3076 (Field Museum, Chicago, *vide* Standley).

This remarkable plant, frequent in the virgin forests of the Main Ridge, was omitted from the Flora, nor has the name hitherto appeared in the Index Kewensis, while Standley in 1930 was unable to trace the description. The genus *Tresanthera* Karst. had been monotypic, being based on *T. condamineoides* Karst., which was collected in rain forests at 500 ft. and upwards near the coast at Puerto Cabello in Venezuela. Solereder, who attributed the type locality of the genus to Mexico instead of Venezuela, distinguished Eggers' material from Tobago by the simpler, few-flowered inflorescence and the colour of the corolla. The first of these characters has proved to be useless, since recent collections from Tobago show the inflorescence to be quite as elaborately many-flowered as in Karsten's plate of *T. condamineoides*. On the other hand, all collections from Tobago note the colour of the flowers of *T. pauciflora* as yellowish-white, pale white, or greenish-white with a purplish tinge; whereas Karsten described the corolla of *T. condamineoides* as reddish-orange, the lobes orange-yellow within. Even more significant perhaps is the fact that the Tobago species is apparently always a shrub, scarcely even a small tree, barely reaching 20 ft. in height and with a stem that cannot be described as a trunk; whereas *T. condamineoides* was said to be a real tree, 50–60 ft. in height, and with a trunk a foot in diameter. Comparison with Karsten's description and plate does not help further towards the differentiation of the Tobago material, nor has any Venezuelan specimen of *T. condamineoides* been seen except Fendler 2366 (Tovar), which is in full fruit and agrees closely with *T. pauciflora*. On the whole it is wisest, in the absence of further evidence about the characters of the Venezuelan tree, to treat the Tobago *T. pauciflora* as an independent species.

Gonzalagunia spicata (Lam.) Maza. *Duggena hirsuta* (Jacq.) Britton; Fl. 2, part i. 14.

Bacolet, dry bushy hillside, Oct. 6th, S. 1623. Low shrub. Leaves greyish below.

Alibertia tobagensis *Sprague et Williams.*

Bacolet, dry thickets on hills, fr. Oct. 21st, S. 1873. A shrub or small tree.

Basanacantha phyllosepala *Sprague et Williams.*

Lambeau Hill, in high virgin forest, about 700 ft., Oct. 7th, S. 1645. A small tree.

Guettarda parviflora *Vahl.*

Bacolet, dry slopes, Oct. 6th, S. 1636. Small tree with twiggy branchlets and reddish-brown corollas.

†**G. scabra** (L.) *Lam.*

Mount St. George-Castara road, frequent in dry forest on Mount St. George slope of the Main Ridge, Oct. 18th, S. 1843. A small tree. The Widow, near Easterfield, 1910, *Broadway* 3844.

Recorded from Tobago by Urban, *Symb. Ant.* 8, 671.

Malanea macrophylla *Bartl.*

Mount St. George-Castara road, in dry virgin forest on the Mount St. George slope of the Main Ridge, Oct. 18th, S. 1844. Scrambling shrub with yellow flowers.

†**Erithalis odorifera** *Jacq.*; *E. fruticosa* L. of the *Flora*, vol. 2, part i, p. 28.

Buccoo Bay, sandy promontory with species of the Mangrove association, Oct. 8th, S. 1668. A small tree up to 30 ft. high. Corolla lobes white, recurved. Fruit turning lead-coloured.

E. fruticosa L. (including *E. odorifera*), was recorded from Tobago by Urban in *Symb. Ant.* 8, 674 (1921), and was admitted to the *Flora* by Williams and Cheesman on the strength of an unlocalised scrap in the Kew Herbarium which was mounted on a sheet of the Jamaican *E. quadrangularis*. This scrap is also apparently to be referred to *E. odorifera* which is again segregated from *E. fruticosa* by S. Moore and Rendle in *Fl. Jam.* 7, 67 (1936). The characters given for distinguishing *E. odorifera*, namely the cup-shaped calyx-limb and the much larger corolla, are convincing and its distribution is also somewhat different since it appears to replace *E. fruticosa* in most of the Lesser Antilles. Urban's Tobago record is probably based on *Broadway* 3787, from Cullodon, May 1910: see his Register of collecting numbers which is preserved at Kew. According to *Broadway* the tree is known in Tobago as "Parrot Apple."

Chiococca parvifolia *Wulfschl. ex Griseb.*

Mount St. George-Castara road, frequent in dry forest on slopes of the Mount St. George side of the ridge, Oct. 18th, S. 1842. A

small shrub, some 12 ft. high, with pale brownish-white corollas and white berries.

***Psychotria pendula** (*Jacq.*) *Urb.*

Roxborough-Parlatuvier road, 5th milepost, in forest reserve of Main Ridge, 1300 ft., Oct. 14th, S. 1767. Creeper. Inflorescence vermilion. Corolla white.

The inflorescences of this gathering are wholly axillary.

P. tobagensis *Urb.*

Great Dog River, in virgin forest on river-bank, Oct. 12th, S. 1738. A small tree. Stipules dark purple, large, about 1.5 cm. long. Inflorescence a very pale, delicate, pinkish-brown. Corolla whitish, with a tinge of the same colour.

P. uliginosa *Sw.*

Caledonia, damp shady ravine in forest, Oct. 11th, S. 1722. Low shrub, 1 ft. high, with whitish-pink flowers and scarlet fruit.

Cephaëlis muscosa *Sw.*

Mount St. George-Castara road, in forest reserve of Main Ridge, 800-1400 ft., Oct. 18th, S. 1852. Small shrub, 2 ft. high, with white corollas and violet drupes.

Rudgea Freemani *Sprague et Williams.*

Bacolet, open dry bushy ground on hills, fr. Oct. 6th, S. 1637. A small tree or shrub with scarlet fruits.

***Borreria eryngioides** *Cham. et Schl.*

French Hill, border of dry track, Oct. 9th, S. 1701. Very erect and stiff. Corolla white. Botanic Station, wild among grasses, 1932, *Broadway* 9067 (fide *Broadway's Register* only, not seen).

B. ocymoides (*Burm.*) *DC.*

Mount St. George-Castara road, moist bank, about 1200 ft., Oct. 18th, S. 1853. Flowers very small, white.

Tobagoa maleolens *Urb.*

Lambeau Hill, in shade in virgin forest, 700 ft., Oct. 7th, S. 1662. Stem and roots evil-smelling especially when pressed. Branchlets spreading. Flowers white.

COMPOSITAE.

Vernonia scorpioides (*Lam.*) *Pers.*

French Hill, open bushy ground on slopes facing north, Oct. 9th, S. 1687. Flowers mauve.

Rolandra fruticosa (*L.*) *Kze.*

Bacolet, a weed in coconut plantations, Oct. 13th, S. 1752.

Eupatorium inulifolium *H.B.K.*, f. **suaveolens** (*H.B.K.*) *Hieron.*

French Hill, open bushy ground on slopes facing north, Oct. 9th, S. 1686. Tall herb with white flowers.

E. macrophyllum *L.*

Great Dog River, dry slopes, Oct. 12th, S. 1749. Flowers white.

Mikania micrantha *H.B.K.*

Ascent of Pigeon Hill, climbing over bushes by trace, 1200 ft., Oct. 16th, S. 1807. Flowers dirty white.

M. scabra *DC.*

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, 1300 ft., Oct. 14th, S. 1770. Climber with white flowers.

Erigeron bonariensis *L.*

Bacolet, roadside bank, Oct. 15th, S. 1794. Heads creamy-white.

E. spathulatus *Vahl.*

Mount St. George-Castara road, on bank by track in forest, Oct. 18th, S. 1839. Heads creamy-yellow.

Clibadium surinamense *L.*

French Hill, dry open slopes, Oct. 9th, S. 1694. Roxborough-Parlatuvier road, in forest reserve of Main Ridge, Oct. 14th, S. 1766, det. S. F. Blake.

Acanthospermum hispidum *DC.*

Plymouth, on village green by the sea, towards Courland Point, Oct. 6th, S. 1638. Flowers pale yellow.

Eleutheranthera ruderalis (*Sw.*) *Sch. Bip.*

French Hill, dry side of track, Oct. 9th, S. 1696. Flowers orange-yellow.

Aspilia verbesinoides (*DC.*) *Blake*, det. S. F. Blake.

Roxborough-Parlatuvier road, wooded banks in forest reserve of Main Ridge, 800-1300 ft., Oct. 14th, S. 1763. Leaves black-dotted beneath. Flowers yellow.

Melanthera nivea (*L.*) *O. E. Schulz.*

Pigeon Point, abundant on sea sands, Oct. 10th, S. 1707. Flowers very pale whitish-mauve.

Spilanthes uliginosa *Sw.*

Roxborough-Parlatuvier road, roadside weed in forests of Main Ridge, Oct. 14th, S. 1772. Flowers deep yellow.

Synedrella nodiflora (*L.*) *Gaertn.*

Great Dog River valley, weed by track in cultivated region, Oct. 12th, S. 1735. Flowers rather pale yellow.

Porophyllum ellipticum (*L.*) *Cass.*

Roxborough-Parlatuvier road, dry bank by trace not far from Roxborough, 500 ft., Oct. 14th, S. 1758.

Pectis humifusa *Sw.*

Bacolet, on low bare crumbling cliffs at the west end of Minister Bay towards Bacolet Point, Oct. 27th, S. 1933. Plants prostrate.

Leaves somewhat fleshy, glaucescent and gland-dotted beneath. Ray florets brownish-chocolate. Disk florets greenish-yellow.

Emilia sonchifolia (L.) DC.

Easterfield road, between Green Hill and Caledonia, weed on roadside, Oct. 11th, S. 1716. Heads narrow, rose-pink.

Chaptalia nutans (L.) Polak.

Mount St. George-Castara road, shady banks by track, Oct. 18th, S. 1836. Heads crimson outside, dirty yellow within.

ERICACEAE.

***Spherospermum buxifolium** Poepp. et Endl. S. *majus* Griseb.

Mount St. George-Castara road, near 8th milepost, in reserve forest of Main Ridge, 1400 ft., Oct. 18th, S. 1854. Pendent from trunks. Corolla pale pinkish-white.

MYRSINACEAE.

Stylogyne lateriflora (Sw.) Mez.

In forests of the Main Ridge above Parlatuvier, Oct. 24th, S. 1904. Shrub with pinkish inflorescence and white acuminate buds.

THEOPHRASTACEAE.

Jacquinia barbasco (Loefl.) Mez.

Store Bay, on dry coral cliffs, Oct. 17th, S. 1819.

***J. revoluta** Jacq.

Bacolet, wooded slope above sea, Oct. 13th, S. 1756. Shrub. Corolla and staminodes pure white, scented like *Philadelphus*.

SAPOTACEAE.

Chrysophyllum argenteum Jacq.

Castara-Parlatuvier road, near Little Englishman's Bay, on forested slope, Oct. 22nd, S. 1881. A large tree. Flowers greenish-white. Belmont, 1910, *Broadway* 3991.

EBENACEAE.

Maba inconstans (Jacq.) Griseb.

Bacolet, common on dry wooded hillsides and in hedges, Oct. 6th, S. 1632. A small tree with green flowers and fruit. "Tobago, haud infrequens," *Eggers* 5550.

OLEACEAE.

Linociera caribaea (Jacq.) Knobl.

Bacolet, dry wooded hillsides, Oct. 6th, S. 1628. Mason Hall, bank of Courland River, Oct. 19th, S. 1861. A small tree with snow-white petals.

APOCYNACEAE.

Rauwolfia Lamarckii DC.

Store Bay, on dry coral cliffs, Oct. 17th, S. 1820. Shrub or small tree. Fruit red. "Tobago, in fruticetis maritimis," ann. 1889, *Eggers* 5928.

Prestonia exserta (DC.) Standl. *P. tobagensis* Urb.

Bacolet, creeping in coconut plantation, Oct. 13th, S. 1753. Back Hill above Charlotteville, 800 ft., Oct. 16th, S. 1799. Corolla yellow with greenish tinge; faucal annulus and anthers pure white.

Tabernaemontana citrifolia Jacq.

Ascent of Pigeon Hill, Oct. 16th, S. 1802. Shrub with white flowers.

Mandevilla hirsuta (Rich.) K. Schum.

Sandy River valley, dry bushy slopes under French Hill, Oct. 9th, S. 1678. Corolla yellow; tube and base of limb deep reddish-brown.

Frequent in the island.

M. subsagittata (R. et P.) Woodson.

Ascent of Pigeon Hill, Oct. 16th, S. 1812. Climber over small trees. Corolla dark yellow, limb reddish-brown at the throat and centre.

ASCLEPIADACEAE

Metastelma decipiens Schltr.

Bacolet, dry scrubby thickets over the sea, Oct. 20th, S. 1871. Corolla white. The Whim, Dec. 1909, *Broadway* 3178.

This species has not yet been recorded from Trinidad.

Gonolobus ciliatus Schltr.

Great Dog River valley, cleared bushy slopes on edge of cacao plantations, Oct. 12th, S. 1745. Corolla green.

Very doubtfully distinguishable from *G. viridiflorus* R. et S.

G. tobagensis Urb. ex descr.

Mount St. George-Castara road, in forest reserve of Main Ridge, Oct. 18th, S. 1840. Climbing over trees. Corolla green; gynostegium pale reddish-brown.

Marsdenia macrophylla (H.B.K.) Fourn. *M. maculata* Hook.

Store Bay, climbing over bushes in a hedge, fr. Oct. 17th, S. 1816. Sterile material from Tobago in the Berlin Herbarium was said probably to be referable to this species by Rothe in Engl. Bot. Jahrb. **52**, 416 (1915).

GENTIANACEAE.

Coutoubea spicata Aubl.

Bacolet, open grassy dry hills, Oct. 6th, S. 1625.

BORAGINACEAE.

Tournefortia bicolor Sw.

Lambeau Hill, in thicket, Oct. 7th, S. 1643.

T. hirsutissima L.

Sandy River valley, Oct. 9th, S. 1685.

CONVOLVULACEAE.

***Ipomoea triloba** *L.*

Store Bay, creeping on low coral cliffs, Oct. 17th, S. 1818. Corolla pinkish-mauve.

Operculina alata (*Ham.*) *Urb.*

Bacolet, dry open hillsides, trailing over bushes, Oct. 6th, S. 1621. Stems winged. Corolla bright yellow.

Merremia dissecta (*Jacq.*) *Hall. f.*

Bacolet, scrambling over bushes by roadside, Oct. 26th, S. 1932. Corolla white; tube dull crimson within and with conspicuous longitudinal lines of this colour.

M. umbellata (*L.*) *Hall. f.*

Bacolet, dry grassy roadside, Oct. 5th, S. 1615. Prostrate, creeping. Corolla bright yellow.

Jacquemontia elongata *Britton.*

French Hill, climbing over bushes on dry slopes, Oct. 9th, S. 1700. Corolla very pale whitish-mauve.

The relationships of this species with forms of *J. pentantha* (*Jacq.*) *G. Don* require critical study.

Evolvulus sericeus *Sw.*

Bacolet, dry hillside, open bare spots on burnt ground among bushes of *Guettarda*, Oct. 21st, S. 1878.

SOLANACEAE.

Solanum dolichostylum *O. E. Schulz.*

Caledonia, on damp rocks in ravine in deep shade, Oct. 11th, S. 1731. Corolla white. Not infrequent in the island, and always found in river-beds.

S. lanceifolium *Jacq.*

Ascent of Pigeon Hill, creeping over bushes by trace, Oct. 16th, S. 1803. Corolla white.

S. nigrum *L.* var. **americanum** (*Mill.*) *O. E. Schulz.*

Bacolet Point, a weed by lighthouse ruins, Oct. 10th, S. 1703. Herb, suffrutescent below. Corollas white. Berries turning black.

S. scabrum *Vahl.*

Lambeau Hill, above Speyside, climbing over low trees, 700 ft., Oct. 7th, S. 1641. Corolla pale violet.

S. Seaforthianum *Andr.*

Roadside hedge, Friendsfield Road, Oct. 9th, S. 1674. Corolla very pale whitish-mauve.

Lycianthes pauciflora (*Vahl*) *Bitter* subsp. **tobagoensis** *Bitt.*

Roxborough-Parlatuvier road, bushy side of track, Oct. 14th, S. 1764. Berries scarlet.

****Acnistus arborescens* (L.) Schlecht.**

Mount St. George-Castara road, in forest reserve of Main Ridge, about 1000 ft., Oct. 18th, S. 1838. A small tree, 20–30 ft. high. Corolla tube white; lobes green with white margins, the upper half recurved. Also from Menna Road, Mason Hall, June 1925, *Williams* in *Herb. Trin.* 11124; and from Easterfield, 1910, *Broadway* 3510, det. Urban (fide *Broadway's Register*).

****Cyphomandra tobagensis* Sandwith, sp. nov.; *C. obliquae* (R. et P.) Sendtn.** quam ceteris speciebus adhuc descriptis ut videtur magis affinis, foliis basi haud vel vix cordatis, corolla albo-viridi distinguitur; *C. Holtoni* Hochr. foliis basi profunde cordatis minus obliquis longe recedit.

Arbor parva, ramulis teretibus, annotinis glabrescentibus hornotinis dense brevissime glanduloso-pilosulis. *Folia* integra, simplicia, solitaria vel per paria subheteromorpha, omnia apice conspicue acuminata, majora ovato-oblonga vel ovata, basi vulgo obliqua rotundata neque cordata, 9·5–21 cm. longa, 5–11 cm. lata, minora ovata vel fere orbicularia, basi vix obliqua distincte sed haud profunde cordata, 4·5–15 cm. longa, 4·2–8·7 cm. lata, chartacea, supra nitida, utrinque minute praecipue secus nervos glandulosa, ceterum glabra, fragrantia, utrinque conspicue reticulata, nervis primariis utroque costae latere 5–6 sursum arcuatis; petiolus 1·8–4 cm. longus, junior dense glanduloso-pilosulus. *Inflorescentia* passim glanduloso-pilosula, apicem versus nutans, 2·5–5 cm. longa, pedunculo sub cicatricibus ad 2 cm. longo; pedicelli inferiores ad 2·2 cm. longi. *Calyx* aperte cupulatus, totus ad 2·5 mm. longus ac ad 4·5 mm. latus, glandulosus; lobi late ovato-triangulares, obscure obtuse cuspidatuli, flore aperto 0·5–1 mm. longi. *Corolla* sordide albo-viridis, tubo brevissimo circiter 1 mm. longo; lobi anguste lanceolati, extra plus minusve glandulosi, dense ciliati, circiter 1–1·1 cm. longi, 2·5 mm. lati. *Stamina* filamentis glabris parte libera 1·75 mm. longa; antherae amethystinae, rectae, circiter 6·5 mm. longae, dense minute papillosae, connectivo dorsaliter gibboso basi loculos superante atque fere aequilato. *Ovarium* ovoideum, glabrum, circiter 2 mm. longum, 1·5 mm. diametro; stylus glaber, 6–7 mm. longus, stigmatibus clavato haud dilatato. *Fructus* ovoideus, acuminatus, 2·6 cm. longus, 1·3 cm. diametro.

TOBAGO. Near Parlatuvier, in forests of Englishman's Bay, April 15th, 1912, *Broadway* 3879 (typus). Roxborough-Parlatuvier road, in forest reserve of Main Ridge near 5th milepost, c. 1300 ft., Oct. 14th, 1937, *Sandwith* 1773: a small tree with dirty whitish-green corollas and amethyst anthers. The flowers, according to *Broadway*, have a disagreeable penetrating odour, and the fruit resembles that of a *Passiflora*.

***Cestrum alternifolium* (Jacq.) O. E. Schulz var. *pendulinum* (Jacq.) O. E. Schulz.**

Bacolet, dry wooded hillside, Oct. 6th, S. 1631. Shrub with greenish-mauve corollas.

GESNERACEAE.

***Tussacia pulchella** (Donn) Rchb.

Between Parlatuvier and Bloody Bay, shady bank by path, Oct. 23rd, S. 1895. Calyx orange-vermilion. Corolla (in bud) yellow.

Episcia mimuloides Benth.

Forests of Main Ridge above Parlatuvier, on damp rocks by stream in deep shady ravine, Oct. 24th, S. 1902. Corolla creamy-yellow (in bud only).

Previously recorded from this neighbourhood by Urban (Fedde Rep. 17, 166) on the strength of *Broadway* 4282. The pedicels are strongly pubescent whereas those of Guiana specimens are practically glabrous, and it is possible that the Tobago plant may deserve at least varietal rank.

Drymonia serrulata (Jacq.) Mart.

Mason Hall, on bushy rocky bank above road, Oct. 19th, S. 1866. Scrambling shrub. Corolla dirty creamy-yellow, limb with reddish-brown blotches and dots forming longitudinal lines along the lobes.

This species has been discovered in Trinidad by several collectors.

Columnea scandens L., det. T. A. Sprague.

Mount St. George-Castara road, in Govt. Reserve Forest of Main Ridge, c. 1000 ft., Oct. 18th, S. 1837. Epiphytic on trees. Corolla vermilion.

Codonanthe Eggersii Urb.

Roxborough-Parlatuvier road, near 3rd milepost, Oct. 14th, S. 1761. Creeping up base of a trunk, the roots not colonised by ants. Leaves thick, fleshy. Corolla white.

In this material the long jointed hairs on the margins of the calyx lobes are far more plentiful and conspicuous than on those of the type collection (Eggers 5848) from the Great Dog River.

Besleria Seitzii Krug et Urb.

Ascent of Pigeon Hill, damp shady bank by path, 1000 ft., Oct. 16th, S. 1805. Corolla limb pure white, the tube sigmoid-curved.

Not infrequent in the wilder forested regions of the island.

Napeanthus subacaulis (Griseb.) Benth. et Hk. f. ex Kze. *Marssonina subacaulis* (Griseb.) Urb. Symb. Ant. 7, 378 (1912).

Forests of Main Ridge above Parlatuvier, about 1000 ft., Oct. 24th & 25th, S. 1915, 1922. Growing in deep shade on damp rocky banks by streams in ravines or by cascades. Corolla very pale lilac.

BIGNONIACEAE.

**Anemopaegma carrerense* *Armitage*.

Ascent of Pigeon Hill, climbing over bushes by path, about 800 ft., Oct. 16th, S. 1800. Corolla tube pale brownish-yellow; limb white. Fruit flat, green.

[*Anemopaegma tobagense* *Urb.* in Fedde Rep. **14**, 311 (1916) is *Ceratophytum tobagense* (*Urb.*) *Sprague et Sandwith* in Kew Bull. 1933, p. 322, and occurs in Trinidad, Venezuela and Guiana, as well as in Tobago.]

**Martinella obovata* (*H.B.K.*) *Bur. et K. Schum.*

Great Dog River, climbing on trees by the river, Oct. 12th, S. 1746. Corolla pale greenish-mauve in bud; tube of open flower greenish-white, limb very pale chocolate-mauve.

**Amphilophium paniculatum* (*L.*) *H.B.K.*

Mount St. George-Castara road, climbing over trees in Forest Reserve of Main Ridge, Oct. 18th, S. 1834. Calyces green. Corolla sticky, pale brownish-red.

Not recorded from Trinidad by Urban in his list of Trinidad *Bignoniaceae* published in Fedde Rep. **14** (1916), but collected by *Broadway* (no. 9086) in fruit in Dec. 1932 on the sea-shore at Moruga, and noticed by the writer in October 1937 on the ascent of Tucuche.

Tabebuia rufescens *J. R. Johnst.*; *Sprague et Sandwith* in Kew Bull. 1932, p. 22. *T. glomerata* *Urb.*

Bacolet Point, in dry thickets by the sea, fr. Oct. 10th, S. 1705.

This is a small tree, frequent in woods on dry slopes of the island.

**T. serratifolia* (*Vahl.*) *Nichols.*; *Sprague et Sandwith*, l.c. p. 22.

Parlatuvier, dry slopes and edges of sea-cliffs, Oct. 23rd, S. 1897. Sterile material taken from small trees 6–10 ft. high. The species also grows to middle size (about 50 ft.). Leaflets wavy-edged and crenate.

ACANTHACEAE.

Ruellia fulgida *Andr.*

Castara-Parlatuvier road, in shade on forested slope near Englishman's Bay, Oct. 22nd, S. 1882. Corolla vermilion-crimson, the limb more or less regular.

Looking certainly native in this neighbourhood in spite of Lindau's comment in *Urb. Symb. Ant.* **2**, 197, and the continental distribution is favourable.

Lepidagathis alopecuroidea (*Vahl*) *Griseb.*

Above Bloody Bay, on shady bank in cacao plantation, Oct. 23rd, S. 1892.

Aphelandra tetragona (*Vahl*) *Nees.*

Lambeau Hill, damp rocky ravine in virgin forest, Oct. 7th, S. 1647. Small tree, 12–15 ft. high. Bracts brownish-mauve and green. Corolla scarlet.

Justicia comata (L.) Lam.

Mason Hall, on rocks in Courland River, Oct. 19th, S. 1859. Corolla very pale whitish-lilac, with purple spots along the central ridge of the lower lip. Also in bed of Betsy's Hope River, 1912, *Broadway* 3873.

Odontonema brevipes Urb.

Slopes of Main Ridge above Parlatuvier, Oct. 24th, S. 1898. Low shrub in deep shade in virgin forest. Flowers white. Endemic.

VERBENACEAE.

Aegiphila perplexa Moldenke.

Ascent of Pigeon Hill, side of path, Oct. 16th, S. 1801. Shrub with dirty yellowish-white flowers.

Citharexylum spinosum L.

Store Bay, on coral cliffs, Oct. 17th, S. 1821. Shrub or small tree with white flowers and pale brownish-red fruit.

LABIATAE.

Ocimum micranthum Willd.

Bacolet, in coconut plantation, Oct. 5th, S. 1612. Corolla pale mauve.

Hyptis atrorubens Poit.

Easterfield road, between Green Hill and Caledonia, Oct. 11th, S. 1714. Herb on shady roadside. Corolla white with purplish-red spots.

H. pectinata (L.) Poit.

Bacolet, dry roadside bank, Oct. 5th, S. 1620. Corolla whitish; lower lip spotted with mauve.

Coleus Blumei auct., an *Bth.*?

Roxborough-Parlatuvier road, completely naturalised by path in forest reserve near 9th milepost, 1000 ft., Oct. 25th, S. 1921. Leaves with crimson-mauve blotch at base, and bronze-purple blotches. Corolla bluish-violet.

NYCTAGINACEAE.

Boerhaavia caribaea Jacq. *B. hirsuta* Willd.

Store Bay, bare ground on top of coral cliffs, Oct. 17th, S. 1827. Sticky. Leaves greyish-white below. Flowers crimson.

Pisonia fragrans Dum. Cours.

Ascent of Pigeon Hill, 800 ft., Oct. 16th, S. 1808. A small tree with pale greenish-white flowers.

AMARANTHACEAE.

Amaranthus dubius Mart.

Great Dog River valley, in cacao plantations, Oct. 12th, S. 1742. Spikes pale green.

Achyranthes indica (L.) Mill.

Bacolet, dry roadside, Oct. 15th, S. 1796.

Alternanthera ficoidea (L.) R. Br.

Store Bay, bare ground on coral cliffs, Oct. 17th, S. 1826.

Philoxerus vermicularis (L.) Pal.

Buccoo Bay, on sand bordering lagoon, Oct. 8th, S. 1671.
Stems prostrate, pinkish-brown. Leaves very fleshy, greyish-green.

PHYTOLACCACEAE.

Trichostigma octandrum (L.) H. Walt.

Parlatuvier, dry wooded slope by path to Charlotteville, Oct. 22nd, S. 1888. Climber over tree. Outer perianth segments whitish-green, inner white, turning purple with age like the ovary.

Rivina humilis L.

Bacolet Point, a weed in ruins of lighthouse, Oct. 10th, S. 1702.

Petiveria alliacea L.

Castara, in shade under coconuts by shore, Oct. 18th, S. 1832.

POLYGONACEAE.

Coccoloba venosa L.

Castara, rocks on shore, Oct. 18th, S. 1831. Shrub with red berries.

PIPERACEAE.

Piper peltatum L.

Shady slopes of French Hill, Oct. 9th, S. 1692.

***P. Schackii** (Miq.) C. DC.

Caledonia, damp shady ravine, Oct. 11th, S. 1724. Shrub, about 10 ft. high. Hitherto known only as an endemic of Trinidad. Also from Englishman's Bay, Nov. 1912, *Broadway* 4272 (Brit. Mus. ; Conserv., Geneva), from Trafalgar, July 1912, *Broadway* 4190 (Conserv., Geneva), and from the north side forests between Charlotteville and Parlatuvier, Nov. 1912, *Broadway* 4284 (Conserv., Geneva), all det. C. DC.

P. tobagoanum C. DC.

Shady slopes of French Hill, Oct. 9th, S. 1691. Shrub, 3-4 ft. high.

***Peperomia emarginella** (Sw.) C. DC.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, 8th-9th mileposts, 1000 ft., Oct. 25th, S. 1918. Creeping along rocky, shady bank of track.

P. rotundifolia Kunth var. *ovata* Dahlst. ex C. DC.

Forests of Main Ridge above Parlatuvier, creeping along branch-lets of tree in rocky ravine, Oct. 24th, S. 1908.

LAURACEAE.

Ocotea leucoxylon (*Sw.*) *Mez.*

Roxborough-Parlatuvier road, wooded slopes on Roxborough side of Main Ridge, Oct. 14th, S. 1762. A small tree with creamy-yellow flowers.

Nectandra coriacea (*Sw.*) *Griseb.*

Bacolet, dry wooded hillside, 200 ft., Oct. 6th, S. 1626. Small tree with white flowers and black berries. Also *Eggers* 5602, from woods at Frenchfield, Oct. 1889.

Omitted from the Notes on Trinidad and Tobago species of *Lauraceae* in Kew Bull. 1933, but recorded from Tobago by Urban in Symb. Ant. 4, and 8.

THYMELAEACEAE.

***Schoenobiblus grandifolia** *Urb.*

Slopes of Main Ridge above Parlatuvier, Oct. 24th, S. 1900. A shrub in deep shade in virgin forest. Flowers yellow.

Frequent on the Northern Range of Trinidad, but apparently not previously recorded from Tobago. The pedicels of this material are articulate close to the base, much lower than those of most Trinidad collections.

Daphnopsis caribaea *Griseb.*

French Hill, here and there on slopes, 750 ft., fl. Oct. 9th, S. 1690. Ascent of Pigeon Hill, fr. Oct. 16th, S. 1813. A small tree up to about 30 ft. high. Flowers cream with orange anthers. Fruit white when ripe.

LORANTHACEAE.

Phthirusa pyrifolia (*H.B.K.*) *Eichl.*

Great Dog River valley, in cacao plantation near mouth of river, Oct. 12th, S. 1733. On cacao tree. Flowers red.

***P. Theobromae** (*Willd.*) *Eichl.*

Bacolet, dry wooded hillside, Oct. 6th, S. 1627. Parasitic on small trees. Flowers cream. *G. L. Meyer* 7, from Roxborough Bay, June 1879, is also referable to this species rather than to *P. Seitzii* Kr. et Urb.

Phoradendron piperoides (*H.B.K.*) *Trel.*

Great Dog River valley, in virgin forest, Oct. 12th, S. 1741. Fruits brownish-orange.

P. trinervium (*Lam.*) *Griseb.*

Ascent of Pigeon Hill, Oct. 16th, S. 1809. On small tree. Fruit brownish-orange.

EUPHORBIACEAE.

Euphorbia lasiocarpa *Kl.*

Bacolet, a weed in coconut plantations, Oct. 5th, S. 1614. Whole plant, including fruit, grey-hoary.

E. Oerstediana (*Klotzsch et Garcke*) Boiss.

Easterfield road, shady roadside between Green Hill and Caledonia, Oct. 11th, S. 1715. Great Dog River valley, in cacao plantations on slopes, Oct. 12th, S. 1743. Leaves and fruits green.

E. thymifolia L.

Mason Hall, prostrate on damp rocks by Courland River, Oct. 19th, S. 1862.

Phyllanthus acuminatus Vahl.

By Easterfield road, 2 miles from Mason Hall, bushy ground, Oct. 19th, S. 1868. Shrub, about 12 ft. high.

P. Niruri L.

Bacolet, dry roadside, Oct. 5th, S. 1619.

Croton gossypifolius Vahl.

Roxborough-Parlatuvier road, dry wooded slopes near Roxborough, Oct. 14th, S. 1759. A small tree with cream-coloured flowers. Also from Campbelton, Nov. 1912, *Broadway* 4267. Both these collections have a great abundance of long simple hairs on the upper surface of the leaves, a character which is absent or not obvious on other collections, although there appear to be intermediate stages in Trinidad material.

C. lobatus L.

Bacolet, open bare spots on dry wooded slopes, Oct. 6th, S. 1633.

Tragia volubilis L.

Bacolet, trailing in coconut plantations, Oct. 5th, S. 1616. Flowers reddish-brown.

MORACEAE.

Trema micranthum (L.) Bl.

Sandy River valley, dry bushy slope, Oct. 9th, S. 1677. Easterfield road, between Caledonia and Green Hill, Oct. 11th, S. 1713. A small tree with orange-brown or red fruit.

Ficus grenadensis Warb.

Roxborough-Parlatuvier road, in open forest of Main Ridge, between 8th and 9th mileposts, about 1000 ft., Oct. 25th, S. 1923. Shrub on bank by path. Receptacles very pale pink.

Agreeing with another collection so named from the Main Ridge (*Broadway* 3910), see Rossberg in *Notizbl. Bot. Gart. Berlin*, 12, 585 (1935), and specimens in Herb. Berol. and Herb. Mus. Brit.

URTICACEAE.

Fleurya aestuans (L.) Gaud.

Great Dog River valley, a weed in cultivated land, Oct. 12th, S. 1736.

Urera baccifera (L.) Gaud.

Between Parlatuvier and Bloody Bay, shady banks especially in cacao plantations, Oct. 23rd, S. 1889. Shrub. Stems and leaves prickly. Inflorescence pinkish-mauve.

U. caracasana (*Jacq.*) *Gaud.* sens. lat., det. E. P. Killip.
Roxborough-Parlatuvier road, wooded slopes, Oct. 14th, S. 1765.

Pilea inaequalis (*Juss.*) *Wedd.*, det. E. P. Killip.
Caledonia, damp bank by stream in deep shade, Oct. 11th, S. 1725. Inflorescence green.

P. microphylla (*L.*) *Liebm.*
Sandy River valley, on rocks, Oct. 9th, S. 1682.

P. tobagensis *Urb.*, det. E. P. Killip.
Caledonia, on rocks in stream in deep ravine, Oct. 11th, S. 1729.
Stems and inflorescences brownish.

***Boehmeria ramiflora** *Jacq.*
Ascent of Pigeon Hill, in shade by path, Oct. 16th, S. 1804.
Shrub ; inflorescence green.

***Phenax Sonneratii** (*Poir.*) *Wedd.*
Caledonia, on rocks in stream in shady ravine, Oct. 11th, S. 1726.
Inflorescence brownish-red.

ORCHIDACEAE (det. V. S. Summerhayes).

Habenaria alata *Hook.*
Near Mason Hall, on dry grassy slopes of Courland River valley, Oct. 19th, S. 1858. Sepals green. Petals and very narrow labellum very pale creamy-yellow.

***Pleurothallis ovalifolia** (*Focke*) *Rchb. f.*
Great Dog River, epiphytic on branches of cacao trees, Oct. 12th, S. 1750. Flowers pale greenish-yellow.

Epidendrum fragrans *Sw.*
Ascent of Pigeon Hill, about 1000 ft., Oct. 16th, S. 1806.
Epiphyte. Flower creamy-white. Labellum caudate-acuminate, with longitudinal purple lines.

***Catasetum macrocarpum** *Rich.*
Roxborough-Parlatuvier road, 8th-9th mileposts, in reserve forest of Main Ridge, 1100-1200 ft., Oct. 25th, S. 1931. Epiphytic on rotten trunk. Pseudobulbs long and sausage-shaped, up to nearly 8 in. long and 1½ in. in diameter. Buds (nearly open) greenish-white, shortly spurred. Scarborough, on trees, 1912, *Broadway* 4288, det. Urban (fide Broadway's Register).

***Maxillaria liparophylla** *Summerhayes*, sp. nov. ; *M. pterocarphae* *Rodr.* similis, sed floribus duplo maioribus, tepalis minus acutis, labello prope medium trilobato lobo medio quam lateralia multo longiore differt.

Planta epiphytica, rhizomate brevi radicibus numerosis tenuibus ramosis instructo. *Pseudobulbi* dense caespitosi, anguste oblongo-ovati, compressi, 1-2 cm. longi, circiter 3 mm. diametro, apice

unifoliati, basi cataphyllis chartaceis vestiti. *Folia* anguste oblonga vel oblongo-ligulata, apice inaequaliter et breviter obtuse bilobulata, basi sensim angustata, petiolo vix distincto, 6–12 cm. longa, 7–14 mm. lata, siccitate oleagineo-nitentia. *Scapi* e basi pseudo-bulbi orti, 3–4 cm. longi, vaginis circiter 3 acutis carinatis imbricatis instructi; bractea vaginis similis, ovarium superans, 1.7–2 cm. longa. *Flores* pallide brunnescenti-flavidi. *Sepalum* intermedium lanceolatum, breviter acuminatum, 16 mm. longum, 2.5–3 mm. latum; sepala lateralia oblique lanceolata, breviter acuminata, basi mentum obtusum vix 2 mm. longum formantia, 17 mm. longa, 2.5–3.5 mm. lata. *Petala* sepalo intermedio similia sed paulo minora, leviter obliqua. *Labellum* prope medium trilobatum, 11 mm. longum, 5.5 mm. latum; lobus intermedius late lanceolatus, acutus, 5 mm. longus, 2 mm. latus, incrassatus, apice leviter canaliculatus; lobi laterales rotundati, 0.5 mm. longi, 1.5 mm. lati; discus callo inferne ligulato apice incrassato hemisphaerico fere usque ad basin lobi intermediarii decurrente instructus. *Columna* semiteres, superne leviter incurvata, 4.5 mm. longa, pede 2 mm. longo. *Ovarium* circiter 1.5 cm. longum, sparse breviterque nigro-furfuraceum.

TOBAGO. Roxborough-Parlatuvier road, 7th–8th mileposts, in forest reserve near summit of Main Ridge, about 1400 ft., Oct. 25th, 1937, *Sandwith* 1925 (type specimen). Epiphyte on rotten branch. Flower pale biscuit-yellow.

There is also a specimen of this species at Kew collected by Jenman on the Kaieteur Savannah (Potaro River) in British Guiana, no. 1222. These two gatherings agree in all particulars. The species was described from dried material and a flower in spirit. The specific epithet is chosen for its allusion to the shining oily-looking upper surface of the dried leaves.—V. S. S.

ZINGIBERACEAE.

Renealmia bracteosa Griseb.

Caledonia, in ravine by stream, Oct. 11th, S. 1723. Inflorescence erect. Inflorescence and buds scarlet. Petals dirty vermilion, creamy-green in the upper half. Berries scarlet.

MARANTACEAE.

Maranta gibba Sm.

Roxborough-Parlatuvier road, in Forest Reserve of Main Ridge, Oct. 14th, S. 1768. Flowers white.

MUSACEAE.

***Heliconia hirsuta** L.f.

Caledonia, in deep shade in forest, Oct. 11th, S. 1732. Petals orange, slightly tinged with vermilion, with greenish tips.

Possibly also collected by Broadway or Eggers, but no specimen has been seen.

***H. psittacorum L.f.**

Bacolet, plentiful in coconut plantations, Oct. 6th, S. 1618. Bracts vermillion. Petals orange-vermillion. Ovary orange-yellow. Berry dark inky-blue when mature.

Also collected by *Eggers* 5476 and *Broadway* 2992, from Scarborough.

BROMELIACEAE.

Tillandsia bulbosa Hook.

Easterfield road, between Green Hill and Caledonia, on tree in cacao plantation, Oct. 11th., S. 1712. Petals and filaments amethyst.

T. usneoides L.

Mason Hall, pendent from trees in valley by river, Oct. 18th, S. 1856. Although three records from Trinidad and Tobago were given in the account of the *Bromeliaceae* of these islands by W. E. Broadway and L. B. Smith (see *Contr. Gray Herb.* **102**, 169 (1933)), not one of them was localised. *Eggers* 5955, from Craig Hall River, Nov. 1889, is a localised specimen from Tobago in the Kew Herbarium.

T. utriculata L.

Mason Hall, by Courland River, Oct. 19th, S. 1864. Epiphyte on bamboo stem. Bracts green bordered with blackish-blue. Petals pale yellowish-green.

Catopsis sessiliflora (R. et P.) Mez.

Great Dog River valley, on cacao trees, Oct. 12th, S. 1747.

Araeococcus micranthus Brongn.

Above Parlatuvier, in rocky ravine by stream in virgin forest of Main Ridge, Oct. 24th, S. 1907.

HAEMODORACEAE.

Xiphidium caeruleum Aubl.

Caledonia, damp bank in shade of ravine, Oct. 11th, S. 1727. Flowers white.

IRIDACEAE.

Trimezia martinicensis (L.) Herb.

Bacolet, dry grassy hillside, Oct. 21st, S. 1877. Petals bright golden-yellow with brown zones in the lower half.

AMARYLLIDACEAE.

Hypoxis decumbens L.

Between Castara and Englishman's Bay, damp grassy side of track, Oct. 22nd, S. 1880. Flowers golden-yellow.

***Curculigo scorzonrifolia (Lam.) Baker.**

Bacolet, dry grassy hillside, Oct. 21st, S. 1876. Very dwarf specimens. Flowers pale yellow.

DIOSCOREACEAE.

Dioscorea alata *L.*

French Hill, frequent in thickets and cacao plantations, Oct. 9th, S. 1688.

LILIACEAE.

Smilax cumanensis *Willd.*

French Hill, climbing over bushes on dry slope, fr. Oct. 9th, S. 1698.

COMMELINACEAE.

Tradescantia geniculata *Jacq.*

Roxborough-Parlatuvier road, on shady bank in cacao region descending to Bloody Bay, Oct. 25th, S. 1919. Inflorescence violet. Calyx green. Petals whitish.

T. multiflora *Sw.*

Mason Hall, damp rocky bank above road, Oct. 19th, S. 1865. Flowers white. Also *Eggers* 5693, from rocky places near Cradley, Oct. 1889.

PALMACEAE.

Desmoncus horridus *Splitg.*

Sandy River valley, climbing in thickets, Oct. 9th, S. 1676. Young fruit green.

CYCLANTHACEAE.

Carludovica cf. **coronata** *Gleason.*

Easterfield road, between Green Hill and Caledonia, in shady forest adjoining cacao plantations, Oct. 11th, S. 1709. Low shrub, some 10 ft. high, supported against small tree. Flowers yellow when young, green when old.

The specimens are conspecific with *Herb. Trin.* 3711 (coll. *Hart*) from Maracas, Dec. 1889, and both collections resemble closely the Guiana sheets of *C. coronata* in all superficial characters, but the identification remains uncertain in the absence of staminate flowers.

C. insularis *Gleason.*

Slopes of Lambeau Hill, in shade by Frenchman's River, Oct. 7th, S. 1639. Growing in large clumps. Flowers green. Staminalodes brown.

The large clumps of this species are frequently seen in shady and rocky streambeds in the island.

ARACEAE.

Xanthosoma Jacquinii *Schott.*

Forests above Parlatuvier, Oct. 24th, S. 1901. Trunk about 1 ft. high and 2-3 in. thick. Petiole winged for a few inches at the base, very long and more or less equalling the lamina. Spathe white except for the green folded tube. Spadix cream.

Exactly resembles *Broadway* 4433 from Englishman's Bay, Nov. 1912, and agreeing with other West Indian material referred to this species by Engler and N. E. Brown.

****Monstera obliqua* (Miq.) Walp. *M. Fendleri* Engl.**

Back Hill above Charlotteville, climbing up a tree, Oct. 16th, S. 1797. Spathe cuspidate, falling when plant is gathered, biscuit-brown on back, creamy-yellow within. Spadix greenish-yellow.

The late Dr. N. E. Brown noted in the Kew Herbarium that *M. Fendleri* is a synonym of *M. obliqua* which was placed by Engler in a wrong section of his key in *Pflanzenreich* 4, 23 B, p. 98 (1908).

***M. pertusa* (L.) de Vriese.**

Easterfield road, between Green Hill and Caledonia, on tree in cacao region, Oct. 11th, S. 1711. Spadix greenish-white.

CYPERACEAE.

****Kyllinga monocephala* Rottb.**

Roxborough-Parlatuvier road, grassy side of track close to Roxborough, about 500 ft., Oct. 14th, S. 1777. Heads white.

Collected in Trinidad at St. Anns, *Broadway* 7887, 8928.

***Dichromena ciliata* Vahl.**

Bacolet, grassy roadside, Oct. 13th, S. 1751. Bracts snow-white near base on upper side.

***D. ebracteata* Standl.**

Mount St. George-Castara road, on damp clayey banks in shade of dry forest on the S. side of the Main Ridge, c. 800–1200 ft., local, Oct. 18th, S. 1845. Spikelets white when young, turning pale brown with age.

This very interesting species, native of Tobago and Margarita, was previously represented at Kew by *Eggers* 5820, from forests on Morne d'Or at 1500 ft., a collection misidentified as *D. radicans* by C. B. Clarke.

***Rhynchospora polyphylla* Vahl.**

Lambeau Hill, high banks bordering forest, Oct. 7th, S. 1654. Leaves curving up in a whip-like manner. Spikelets very pale.

***Fimbristylis ferruginea* (L.) Vahl.**

Buccoo Bay, abundant on sandy ground behind mangroves, Oct. 8th, S. 1670. Spikelets brown.

***F. monostachya* (L.) Hassk.**

Bacolet, bare ground in dry scrubby thickets on slope above sea, Oct. 20th, S. 1870. Spikelets pale green, whitish when old.

***Scleria latifolia* Sw.**

Mount St. George-Castara road, in forest reserve of Main Ridge, Oct. 18th, S. 1850.

***S. pterota* Presl.**

Bacolet, in dry coconut plantations, Oct. 5th, S. 1617.

***Becquerelia cymosa* Brongn.**

Roxborough-Parlatuvier road, banks in virgin forest of Main Ridge, c. 1300 ft., Oct. 14th, S. 1776.

Calyptracarya glomerulata (*Brongn.*) *Urb.*

Mount St. George-Castara road, in forest reserve of Main Ridge, c. 1200 ft., Oct. 18th, S. 1849. Forest Reserve, April 1911, *Broadway* 4153. Also collected in Trinidad, in Quare river forests, March 1934, *Broadway* 9368.

The form with broad leaves, which has been described as *C. intermedia* C. B. Cl.

GRAMINEAE (det. C. E. Hubbard).

Sporobolus virginicus (*L.*) *Kth.*

Buccoo Bay, on sandy shore of promontory, Oct. 8th, S. 1672.

Leptochloa virgata (*L.*) *Beauv.*

Bacolet, dry banks by sea, Oct. 5th, S. 1608.

***Pharus latifolius** *L.*

Lambeau Hill, in deep shade of virgin forest, c. 700 ft., Oct. 7th, S. 1663. Spikelets purplish and green.

***Axonopus amplifolius** *Chase* mss., det. Agnes Chase.

Parlatuvier, dry slope above sea, in shade of bamboos, Oct. 22nd, S. 1887. Only known otherwise from Brazil.

A. compressus (*Sw.*) *Beauv.*

Caledonia, damp ravine by Easterfield road, Oct. 11th, S. 1720.

***Paspalum decumbens** *Sw.*

Great Dog River, on boulders in river-bed, Oct. 12th, S. 1740. Leaves more or less glaucous beneath.

P. paniculatum *L.*

Bacolet, dry coconut plantation, Oct. 5th, S. 1611.

P. saccharoides *Trin.*

Caledonia, high bank of Easterfield road, Oct. 11th, S. 1719. Panicle brownish-purple with white hairs.

P. vaginatum *Sw.*

Pigeon Point, on sea sands, Oct. 10th, S. 1706.

Panicum fasciculatum *Sw.*

Bacolet, dry banks by the sea, Oct. 5th, S. 1610. Spikelets reddish-brown.

P. maximum *Jacq.*

Bacolet, dry banks by sea, Oct. 5th, S. 1609. Panicle rhachis glaucous. Stigmas purple.

Ichnanthus pallens (*Sw.*) *Munro.*

Bank near Parlatuvier, by path to Castara, Oct. 22nd, S. 1883.

Lasiacis divaricata (*L.*) *Hitchc.*

Shady slope near Parlatuvier, Oct. 22nd, S. 1884.

Isachne disperma (Lam.) Doell.

Mount St. George-Castara road, in forest reserve of Main Ridge, about 1200 ft., Oct. 18th, S. 1851. Scandent with green spikelets.

Setaria barbata (Lam.) Kth.

Damp shady roadside banks above Charlotteville, Oct. 7th, S. 1656.

S. paniculifera (Steud.) Fourn. ex Hemsl.

Sandy River valley, in deep shade of gully, Oct. 9th, S. 1683.

Pennisetum polystachyon (L.) Schult. *P. setosum* (Sw.) L. Rich. of Hitchcock's Manual.

Bacolet, grassy roadside, Oct. 13th, S. 1755.

Olyra latifolia L.

Bacolet, climbing in dry woods on hillside, Oct. 6th, S. 1629.

Raddia guianensis (Brongn.) Hitchc.

Mount St. George-Castara road, local in dry forests of the windward slope of Main Ridge, 800–1200 ft., Oct. 18th, S. 1846.

Bothriochloa intermedia (R. Br.) A. Camus var. **acidula** (Stapf) C. E. Hubbard.

Store Bay, bare ground on coral cliffs, Oct. 17th, S. 1824. Spikelets brown.

PTERIDOPHYTA (det. A. H. G. Alston, British Museum).

46 species of Pteridophyta and 4 species of *Selaginella* were collected, of which the following are first records for Tobago:

***Trichomanes crispum** L., sens. lat.

Roxborough-Parlatuvier road, banks in forest reserve of Main Ridge, 1000–1400 ft., Oct. 14th, S. 1789.

***T. polypodioides** L.

Slopes of Main Ridge above Parlatuvier, creeping up trunk of prickly tree fern, Oct. 24th, S. 1911. Very delicate, pale green.

***Dryopteris pyramidata** (Fée) Maxon.

Roxborough-Parlatuvier road, damp banks in forest reserve of Main Ridge, 1000–1400 ft., Oct. 14th, S. 1782. Belmont woods, 1910, *Broadway* 3548, det. Urban (fide *Broadway's Register*).

***Blechnum lanceola** Sw.

Roxborough-Parlatuvier road, damp banks in forest reserve of Main Ridge, 1000–1400 ft., Oct. 14th, S. 1780.

***Acrostichum aureum** L.

Bloody Bay, on damp coast rocks, Oct. 23rd, S. 1891.

***Elaphoglossum Lingua** (Raddi) Brack.

Slopes of Main Ridge above Parlatuvier, creeping along rotten wood in deep rocky ravine in forest, Oct. 24th, S. 1906.

***Gleichenia bifida** (Willd.) Spreng.

Roxborough-Parlatuvier road, in forest reserve, 1000–1400 ft., Oct. 14th, S. 1779.

***G. flexuosa** (Schrad.) Mett.

Caledonia, on dry banks by Easterfield road, Oct. 11th, S. 1717.

***Aneimia hirsuta** (L.) Sw.

Mason Hall, on dry slopes (covered with grass and bamboos) of the Courland River valley, Oct. 19th, S. 1857. Sandstone bank, Les Coteaux, 1909, *Broadway* 3087, det. Urban (fide Broadway's Register).

LVI—ECOLOGICAL ISOLATION.*—W. B. TURRILL.

The taxonomist has found that the classification of organisms into families, genera, and species, and at times into intra-specific groups, to which names are given, has much practical convenience. The species category is, for several reasons, the most important and has been the subject of most dispute. It is probable that the Linnean method of binomials for species has been partly unfortunate in so far as it has tended to increase belief in the fixity of species and, even to the present time, to divert attention from the very important fact that many, and possibly a large majority of, accepted species are groupings of individuals made by the taxonomist for the convenience of biologists. There can be no scientific objection to any method except failure—complete or relative. It is probable that the Linnean system of nomenclature has served a purpose which no other system could have served, but modern research is imposing a very great strain upon it and the desirability of new schemes will have to be considered in the near future. The recent development of cytology, ecology, and genetics, in particular, is directing the attention of biologists to the causes which keep species separate, and it is being found that the separation is due to a considerable diversity of causes, that it is of all degrees, and that it may be from more or less temporary or local to relatively permanent or constant over a wide geographical range.

The taxonomist finds it convenient to insist that his species shall be definable in morphological terms intrinsically and extrinsically. Exceptions occur in specialized bacteriology, but in general an accepted species is defined by all its members having certain characters in common and by certain of these characters not being present in members of any other accepted species, or, at least, not present in a given combination. Such criteria, however, are used for the definition of any taxonomic group, and by themselves do not distinguish a species from a genus or a variety. For delimitation of his species the taxonomist has, therefore, in addition to, not instead of, morphological criteria, to turn his attention to isolation and this

* Paper contributed to a symposium on "The Mechanism of Evolution" at the meeting of the British Association at Cambridge, 1938.

involves a study of what are basically physiological criteria and causes. The species category stands out as of greatest interest and importance because of its practical value to biologists in general and because it is possible to apply to the species methods of analysis which are usually inapplicable to other taxonomic groups, as, for example, experimental methods.

A group is a "better" species the greater its internal uniformity and the greater its isolation. Ecological isolation is undoubtedly important for speciation in plants but it is not easy to find a satisfactory definition of the phrase. One might say that for a species it is living under different conditions from its congeners. This would involve many examples that also showed geographical isolation, and certainly some with genetical, chromosomal, and physiological isolation, but it is a feature of isolation that it tends to become cumulative. The available evidence shows that the first step in isolation may be any one of the factors dealt with in separate papers in this symposium. It is possible that ecological barriers are frequently more easily broken down than others, except geographical barriers, by artificial interference and they are also more subtle, but this does not mean that they are less effective in nature. As a botanist I take my examples from the plant kingdom, and I am uncertain if ecological barriers play as great a part in speciation in animals as they do in plants.

That plants are adapted to the conditions under which they grow in nature is a truism, so long as there is no implication as to how the adaptation has arisen. The factors of the environment can be roughly grouped under climatic, edaphic (soil), and biotic, these being every one complex and showing all kinds of interaction one with the others. They act together and through one another though one can often be distinguished as having major control in a given set of conditions and for a given species. Thus Tansley found that the calcifuge *Galium saxatile* L. would grow on calcareous soil by itself and similarly the calcicole *G. sylvestre* Poll. (*G. asperum* Schreb.) on acid soil, but grown together *G. saxatile* crowded out *G. sylvestre* on acid and *G. sylvestre* speedily dominated *G. saxatile* on calcareous soil. *Rumex Acetosella* L., an acid soil indicator in most communities in this country, is said to grow well on neutral or alkaline soils in the absence of competition with other species. *Bromus erectus* Huds. flourishes on calcareous soils—chalk and oolites—but only in the absence of heavy grazing. Garden cultivation is often successful not because the plants are given good soil, water, warmth, etc., but because they are protected from the competition of plants which would otherwise dominate and literally exterminate them under the same conditions. Many other examples could be given to show the complexity of ecological limitation and therefore of ecological isolation. An attempt will, however, be made to isolate, as far as possible, the influence of the ecological factors, by considering examples where climatic, edaphic, and biotic factors respectively seem outstandingly important.

Climatic factors causing isolation.

Since climate affects large areas of the earth's surface one finds climatic isolation closely linked with geographical isolation. Probably the clearest examples of isolation of taxonomically related species caused by factors usually considered together as climatic are some of the altitudinally vicarious species. Altitude affects the factors of light, temperature, rainfall, and exposure, and is, therefore, itself complex. In working at the flora of the Balkan Peninsula I have found a fair number of species pairs or groups of different altitudinal range but occurring in and sometimes limited to the same geographical area, often on one mountain range or massif. Taxonomic analysis suggests strongly that these species have diverged owing to selective action of climates at different altitudes.

A few examples may be given :—

Bellis longifolia Boiss. et Heldr. and *B. silvestris* Cyr.

Crepis auriculaefolia Sieb. and *C. Raulinii* Boiss.

Hypochaeris tenuiflora Boiss. and *H. cretensis* Bory et Chaub.

Convolvulus radicosus Heldr. et Sart. and *C. cantabricus* L.

Chionodoxa cretica Boiss. et Heldr. and *C. nana* Boiss.

A wide field for detailed ecological research, much of it autecological, is opened up by a consideration of the geographical elements of the British flora. The recent analyses by Salisbury and Matthews will suggest many examples. The southern and western elements are particularly interesting. The western distribution of *Ulex Gallii* Planch as compared with the wider range of *U. europaeus* L. is only one instance of the control of milder temperatures and greater humidity. Many of the phytogeographical problems of the British flora can only be solved by intensive studies on single species or small groups of congeneric species and it is much to be desired that botanists undertake such research.

Temperature appears to be important as a limiting factor for the range of microspecies in the *Ajuga chamaepitys-chia* group. Light in part controls the exact distribution of certain species of *Primula* and *Poa*. The reason for certain species flourishing only in "sea-air," not in any limited edaphically peculiar coastal habitat, is a fact which does not appear to have been analyzed. Such plants as *Agropyron pungens* R. et S., *Carduus tenuiflorus* Curt., *Smyrniolum Olusatrum* L., *Plantago Coronopus* L., *Sedum anglicum* Huds., and a number of others chiefly occur "near the coast," but the reasons for this ecological preference are unknown.

Atmospheric humidity is an important factor in the distribution of *Fagus orientalis* Lipsky, at least near the western parts of its range. In Bulgaria, for example, *F. orientalis* is limited to the sheltered relatively damp valleys below 800 m., while at and above 1000 m. on the drier and more exposed hill-sides *F. silvatica* L. forms extensive woods, where man has not destroyed them. In the intervening zone intermediates sometimes occur but their status is at present rather uncertain.

Edaphic factors causing isolation.

Within an essentially similar climatic area many species are limited in range by soil conditions, or, perhaps it is better to say, conditions of the substratum. Instances of taxonomically closely related calcicole and calcifuge species are well known and the classic examples of *Rhododendron hirsutum* L. (calcicole) and *R. ferrugineum* L. (calcifuge), *Gentiana Clusii* Perr. et Song. (essentially calcicole) and *G. Kochiana* Perr. et Song. (mainly calcifuge), and *Achillea atrata* L. (calcicole) and *A. moschata* Wulf (calcifuge), in the Alps, are often quoted. In the Balkan Peninsula serpentine rocks limit the distribution of a not inconsiderable number of plants. Thus Pančić gives a list of 40 species and varieties which he had observed on the serpentine soils but not elsewhere in Serbia. Novák has recently published interesting accounts of the serpentine flora of S.E. Europe. Typical serpentine species include: *Ephedra macedonica* Košanin, *Halacsya Sendtneri* Dörfler, *Potentilla Visianii* Panč., *Euphorbia serpentini* Novák, *E. glabriflora* Vis., *Sedum serpentini* Janchen, *Viola dukadjinica* W. Becker and many others. It is interesting to note here that interaction of climatic and edaphic factors can cause considerable differences in habitat preferences in different parts of a species range. Thus, in the western Balkan Peninsula *Buxus sempervirens* occurs on serpentine rocks and avoids limestones while in north-western Europe it is naturally limited to calcareous rocks.

Water content of the substratum sometimes separates species ecologically. Thus *Alopecurus pratensis* L. of meadow land and *A. geniculatus* L. of wet marshy places will hybridize but the different ecological preferences keep the species essentially distinct. *Stachys sylvatica* L. (hedge-row banks and woods) and *S. palustris* L. (marshes) are congeners with different water preferences. Hybrids between them (known as $\times S. ambigua$ Sm.) are not infrequent but the two have, for all practical purposes, to be accepted as distinct species. *Lotus corniculatus* L. (of pastures) and *L. major* Scop. (of marshes) are also usually clearly defined in ecological distribution. *Geum urbanum* L., of drier ground and *G. rivale* L., of wetter soil, inbreed when they meet, but the species on the whole keep distinct. Different salinity preferences enable, with some exceptions, *Triglochin maritimum* L. of salt marshes and *T. palustre* L. of fresh-water marshes, to limit themselves to different habitats. *Scirpus lacustris* L., in this country, flourishes in hard waters, and *S. Tabernaemontani* Gmel. usually in brackish waters.

More detailed research has been done on the bladder-campions of the *Silene maritima* group. The widely spread *S. Cucubalus* Wib. (*S. vulgaris*) occurs in grassland, in woods, in brushwoods, and as a weed in arable land. *S. maritima* L. is limited to coastal shingle, sandy shingle, cliff sides, more rarely incompletely closed coastal grassland, and river and mountain shingle. It prefers an open exposed habitat where its more or less prostrate stems and chamaephytic habit are

not at a disadvantage in competition with tall growing vegetation. Other factors of its life-history, such as peculiarities in the germination of the seeds, make it suited to its habitat range as compared with *S. Cucubalus*. The line of demarcation between the two species is rarely overstepped in nature yet the two species are perfectly fertile one with another reciprocally and their hybrids are fertile. Their chromosome numbers are the same and they are not cytologically distinguishable so far as research has gone. Ecologically and genetically a similar result has been reached by research on *Silene glareosa* Jord, and *S. alpina* Thomas when these were compared one with another and with *S. Cucubalus*. Habit differences keep these microspecies separate one from another, except for hybrids in the ecotones, because there is a marked correlation between habit and life-history and habitat, particularly the nature of the substratum which in turn mainly controls the associated plants. The tall-growing *S. Cucubalus* can compete with taller vegetation but cannot maintain itself on open exposed shingle and scree, the prostrate stems of *S. maritima* on shingle and of *S. alpina* on schistose or gneissic screes and the ascending slender stems of *S. glareosa* amid shaded limestone rocks and boulders are able to establish an open vegetation where, but only where, their respective habitat needs are met.

Biotic factors causing isolation.

Biotic factors are probably the most difficult of all ecological factors to study because of their complexity and the difficulty of experimenting with them without unduly modifying their natural action. Man with his large flocks and herds of domesticated animals has geologically speaking only recently appeared on the scene and cannot yet have been responsible for much speciation in the plant kingdom. There is, however, no doubt that man is likely to become increasingly important in modifying nature by enabling new species to establish themselves. Thus by cutting down forests on the hill-slopes in the Nearer East species of *Verbascum*, *Thymus*, *Dianthus*, *Silene*, and other genera have been able to extend their areas, to meet, and to hybridize. That certain segregates or allopolyploids resulting from such hybridization may be selected or are in process of selection seems probable. The making of new habitats, by draining, deforestation, and all the processes of cultivation, must also favour certain mutations at the expense of others. The effects of intensive preferential grazing continued over centuries must also be a selective factor of importance.

Competition of plants with plants is most important in studies of succession, and the distribution of even microspecies, etc., is sometimes controlled by this. Thus apomicts of *Taraxacum laevigatum* (Willd.) DC. can, in general, stand much more intensive competition than apomicts of *T. officinale* Web. Complete isolation here is rather through the occurrence of apomixis than by ecological

preferences, but the latter are so well marked that isolation would result even with amphimixis.

The importance of entomophily and the resulting specialization to a limited number of insect visitors is generally recognized and the well-known works on pollination give many details. The greater the specialization of both flower and insect the greater the chance of isolation and establishment of a new mutation or non-segregating hybrid. The occurrence of *Salvia Jurisicii* Košanin with its flowers twisted through 180° may be mentioned in this connexion. A good figure and a description will be found in the Botanical Magazine tab. 9250.

Specialization of parasites for certain hosts has also been important in isolation leading to speciation. The numerous and complicated examples in the bacteria and fungi are beyond my province but even in the flowering plants there are instructive examples. Thus the three subspecies or micro-species of *Viscum* are limited: *V. album* L. to dicotyledonous hosts, *V. laxum* Boiss. to species of *Abies*, and *V. Pini* (Wiesb.) to species of *Pinus*. Morphologically the differences are very slight. In *Orobanche* we find every transition from *O. minor* Sm. with a hundred known hosts to *O. Hederae* Duby limited to the ivy.

The well-known experimental work of Turesson in Sweden has shown that within the taxonomic species some degree of isolation of populations occurs with correlation between a specialized habitat and certain morphological (and presumably also physiological) characters. Such populations Turesson terms ecotypes. Although I am unable to accept the whole of his theoretical scheme without reservations or modifications I express a very great admiration for his researches. These show clearly that individuals with certain characters are selected by the habitat—one might almost say that certain characters are selected by the environment and that others are ignored and therefore the population consists of individuals all homozygous for ecologically important genes but often mixed for ecologically unimportant genes. While it is doubtful if there be any hard and fast line between Turesson's ecotypes and ecospecies, in the sense that it is difficult to know whether a given ecologically isolated population is to be termed an ecotype or an ecospecies, there is no doubt that Turesson's experiments prove the importance of ecological isolation as a factor separating populations differing in morphological characters. That some ecotypes are incipient species is very likely, but this has still to be proved. The work on *Silene*, already briefly mentioned, shows that ecological limitations may alone prevent the amalgamation of two or more species into one still more polymorphic one. Ecological isolation may thus precede, as it may in other examples follow, cytological, geographical, or some other kind of isolation. An accumulation of factors all intensifying isolation may then lead to such an inter-specific barrier that the species concerned remain absolutely distinct one from another.

There is a converse to this picture which must be referred to briefly, namely the isolation of areas of similar ecological attributes. Phytogeographers know of a number of rather striking examples of regions widely isolated geographically but with similar climates. There is then frequently a marked resemblance in their plant communities—sometimes only in the habit and life-form of the components but sometimes also in their taxonomy. Thus both the macchie of the Mediterranean Region and the chaparral of California have species (though different species) of evergreen oak and *Arbutus*. At the other end of the scale of isolation by distance, areas of marsh, bog, woodland, mountain plateau, etc., within the same geographical region are often now separated by distances wider than can be traversed by normal pollinating agents (especially insects) or fruits and seeds. Of course, such isolation is of all degrees and varies from species to species but it gives a chance for divergent, convergent, or parallel evolution under similar but more or less isolated ecological conditions.

Time has not permitted of my giving more than a very brief survey of the importance of ecological isolation in the separation of species. In preparing this paper I have particularly been struck with the tremendous amount of detailed research which has still to be done on the species of a flora even so well known taxonomically as that of the British Isles or the Balkan Peninsula. This is true not only for autecology but also for intra-specific variation—genetical and ecotypic. Without wishing to overstress the importance of ecological isolation it is highly desirable that it should be intensively studied in wild floras (and faunas) before man's interference is carried so far that natural vegetation becomes only a palaeobotanical phenomenon.

LVII—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: XVIII.*

THE ANTS OF THE ROYAL BOTANIC GARDENS, KEW.
A. NORMAN BRANGHAM.

I. A LIST OF THE COSMOPOLITAN AND INTRODUCED FORMICIDAE RECORDED FROM THE GARDENS.

PONERINAE.

1. ***Ectatomma regulare* Mayr.** (Mexico, Central America, Brazil.)

Two workers, propagating pits, 1911 (Donisthorpe 1911, 368).

2. ***Diacamma rugosum* Le Guill.** subsp. ***vagans* F. Smith** var. ***indica* Forel.** (India.)

In case, June 1898 (Bingham 1906, 27, as *D. vagans*).

* Continued from K.B. 1936, 66.

3. **Ponera coarctata** Latr. subsp. **boerorum** Forel. (Natal.)

Winged female, palm house ; workers, fern house, January 1908. (Donisthorpe 1908 A, 122). Workers, fern house, palm house (common), November 1910 (Donisthorpe 1911 B, 14).

4. **Ponera opaciceps** Mayr. (Brazil, Uruguay, Mexico, Porto Rico, Texas.)

Two workers, propagating pits, May 1911 (Donisthorpe 1911 A, 368).

5. **Ponera punctatissima** Roger. (England, Germany, France, Switzerland, Canary Islands.)

This species has been doubtfully classified as a British species. It was first found in this country in 1860 in London by H. Squire ; it has only been found in hot-houses and bakeries, etc., seeming to indicate its introduced or cosmopolitan nature. Donisthorpe (1927) makes no mention of this species having been recorded at Kew Gardens, although he cites other hot-houses in different parts of the country as having yielded it.

During the last four or five years, I have found it commonly in many houses and in the propagating pits.

On October 9th, 1937, I captured one ergatoid male of this species in Pit no. 23, under a flower-pot. The male is invariably apterous in this species as opposed to the great majority of male *Formicidae*, and is extremely rare here ; the specimen taken by myself was only the third or fourth one ever recorded in Britain. The first was taken by Britten in Cumberland in 1913, and Donisthorpe has transferred a male from the Oxford collection to the British Museum (Natural History) Collection. H. Britten, Jun., captured a male at York in 1925. This male, captured in Pit 23, was found alone, although there were at least three nests under flower-pots in this pit. Winged and fertile females, workers, and brood were plentiful.

6. **Anochetus mayri** Emery. (Antilles.)

One worker, hot-house, November 1911 (captured by W. C. Crawley).

MYRMICINAE.

7. **Pseudomyrma gracilis** F. (South and Central America.)

Three workers, March 1912 (Donisthorpe 1927).

Living and dead workers on plant from Calcutta, May 1910.

8. **Monomorium destructor** Jerd. (Cosmopolitan species.)
(Donisthorpe 1911 A, 368).

9. **Monomorium minutum** Mayr. (Italy, Corfu, Syria, Algeria.)

On plant, 1908 (Donisthorpe 1908 B, 231). Fern pits, February 1909 (Donisthorpe 1909, 261).

10. **Monomorium pharaonis** L. (Cosmopolitan species.)

This ant has also been classified as a British species although it has been definitely brought into this country from abroad, and, like

Ponera punctatissima, can be found here only in hot places, in high artificial temperatures.

Bingham has recorded *Monomorium pharaonis* from Kew Gardens (Bingham 1906, 28). I have found it occasionally in recent years in the orchid house, although not during my last visit (9.10.37), the most recent records I have being by Donisthorpe, who found it in a restaurant in Windsor Forest, and a recent record of my own from a restaurant in Watford (26.9.37).

11. *Pheidologeton diversus* Jerd. (India, Burma, Malay.)

A dealated female, and small workers in fern pits, November 1909 (Donisthorpe 1911 A, 368).

12. *Cremastogaster scutellaris* Ol. (Mediterranean, North Africa, Tunis.)

In virgin cork, 1906 (Bingham 1906, 28). With *Colobopsis truncata* Spin. in cork, 1909 (Donisthorpe 1909, 251).

13. *Pheidole gertrudae* Forel. (Brazil.)

Winged female, soldiers, workers, propagating pits, May 1911 (Donisthorpe 1911 A, 368).

14. *Pheidole anastasii* Emery var. *cellarum* Forel. (Cosmopolitan species.)

Workers and soldiers abundant, February 1908, in orchid house (Donisthorpe 1908 A, 122).

15. *Pheidole rhombinoda* Mayr. (India, Ceylon.)

A dealated female, soldiers and workers, September 1912 (Donisthorpe 1927).

16. *Tetramorium guineense* F. (Cosmopolitan species.)

Dealated females, and workers, December 1910 (Donisthorpe 1911 A, 368).

17. *Tetramorium simillimum* Smith. (Cosmopolitan species.) (Saunders 1880, 223.)

18. *Tetramorium magitae* Forel. (Ceylon.)

Workers, January 1911 (Donisthorpe 1911 A, 368).

19. *Wasmannia auro-punctata* Rog. (West Indies.)

Common in almost every house since 1907. H. Donisthorpe was the first to discover this tiny yellow species at Kew Gardens in the propagating pits in 1907 (Donisthorpe 1907, 122), mentioning its commonness there, which I was able to confirm amply on October 9th, 1937, particularly in the tropical palm house, where small colonies were found in almost every hollow twig lying on the soil, while regular streams of them were walking slowly up and down in single file along the trunks of the palms to the leaves above. I was unable to locate a central nest, although each twig had its share of larvae, pupae, and workers, but neither of the sexes was discovered.

20. Triglyphothrix striatidens Emery. (India, Burma, Ceylon, Tunis, Sierra Leone.)

Propagating pits, 1906 (Bingham 1906, 28, as *T. obesa* st. *striatideus*). Plentifully in the fern and palm houses (Donisthorpe 1908, 122). On October 9th, 1937, I found only one worker of this species in the temperate fern house, walking alone, and no colony was located.

21. Strumigenys rogeri Emery. (West Indies).

A few workers in propagating pits, 1907 (Donisthorpe 1908 A, 122, and 1908 B, 231).

22. Solenopsis geminata F. (South and Central America ?)

This species was taken for the first time in the country in the propagating pits by Donisthorpe and myself independently within a few days of each other, in 1932. I have not seen it there for the last few years owing to the vigorous methods taken by the staff to exterminate this ant, which is a particularly tenacious pest.

DOLICHODERINAE.

23. Tapinoma melanocephalum F. (Cosmopolitan species.)

In palm house, September 1886 (Billups 1887).

24. Tapinoma minutum Mayr. (New South Wales.)

A number of workers, 1911 (Donisthorpe 1911 A, 368, As *T. melanocephalum*).

25. Technomyrmex albipes F. Smith. (India, Malay Isles, New Guinea.)

Palm House, 1906 (Bingham 1903, 301, and 1906, 28). In 1908 Donisthorpe discovered an apterous form of the male (Forel 1908, 21). In 1910 Donisthorpe found a short-winged male, suggesting that it might be a mermithaner (Donisthorpe 1911 B, 15). On October 9th, 1937, I found all forms of this species in the palm house.

FORMICINAE.

26. Plagiolepis alluaudi Emery. (Seychelles.)

(Saunders 1896, 26, as *P. flavidula*). Common in palm house, December 1907 (Donisthorpe 1908 A, 122).

27. Brachymyrmex (Brachymyrmex) patagonicus Mayr. (Central America.)

In orchid house, common, 1909, 1910 (Donisthorpe 1909, 251).

28. Prenolepis nitens Mayr. (Ukraine, Balkan Peninsula, Asia Minor, East coast of Black Sea, North-east Italy.)

In 1884 Saunders cited this species as being British, as he had recorded it from the New Forest and Bournemouth (Saunders 1884, 270, as *Tapinoma nitens*, and 1896, 25). Dale captured a single specimen of this species at Bournemouth. F. Smith gives Wales

as the habitat of this ant (F. Smith 1855, 112 as *Tapinoma polita*). Saunders also gives the origin of *Prenolepis nitens* as Wales (Saunders 1880, 211 as *Tapinoma nitens*).

This ant has not been taken again in any of the localities mentioned by these earlier entomologists, and Bingham and Donisthorpe maintain that there is every reason to suppose that it is an introduced ant. Bingham has taken it at Kew in the tropical fern house (Bingham 1906, 28).

29. *Paratrechina (Nylanderia) flavipes* F. Smith. (Japan.)

A complete colony in lily bulbs, 1907 (Donisthorpe 1908, 122).

30. *Paratrechina (Nylanderia) steinheili* For. var. *minuta* For. (Antilles.)

Workers, palmhouse, 1909 (Donisthorpe 1909, 251).

31. *Paratrechina (Nylanderia) vividula* Nyl. (Cosmopolitan species.)

Workers, palm house, March 1896. Pit 18, 1908 (Donisthorpe 1927).

32. *Paratrechina (Nylanderia) vividula* Nyl. subsp. *antillana* Forel. (Antilles.)

Workers, palm house, 1910 (Donisthorpe 1911 A, 369, as *Prenolepis vividula* subsp. *antillana*, and 1911 B, 15).

33. *Paratrechina (Nylanderia) braueri* Mayr. subsp. *donisthorpei* Forel.

First taken at Kew Gardens by Donisthorpe in 1896. Fern, palm, lily, houses, December 1910 (Donisthorpe 1911 B, 15).

34. *Paratrechina (Paratrechina) longicornis* Latr. (Cosmopolitan species.)

Lily house (Farren-White 1895, 237, as *Tapinoma gracilescens*). Propagating pits, 1906 (Bingham 1906, 28). It has been very common in most of the houses for some years (Crawley and Donisthorpe 1912, 23).

This strange looking species, with its exceptionally long, spindly legs, is common throughout the hot-houses, and may be seen running actively along the supports of the beds. In the fern house a drain was opened, and an enormous colony was found below, reaching down to the hot-water pipes, a few feet below the surface of the floor. I captured a winged female in the temperate house on October 9th, 1937.

35. *Acanthomyops (Donisthorpea) niger* L. subsp. *lasiodes* Emery. (Italy.)

One dealated female, orchid house, October 1911 (Donisthorpe 1911 A, 369).

36. *Camponotus (Myrmothrix) abdominalis* F. subsp. *stercorarius* Forel. (Central America.)

One large worker on *Laelia gouldiana*, orchid house, 1910 (Donisthorpe 1911 A, 369).

37. *Camponotus (Myrmophaenus) novogranadensis* Mayr. (Central America, Columbia, Brazil.)

Large and small workers, orchid house, December 1912 (Donisthorpe 1927).

38. *Camponotus (Colobopsis) truncatis* Spin. (South and Central Europe, North Africa.)

With *Cremastogaster scutellaria* (see above no. 12) in virgin cork, April 1909, fern house (Donisthorpe 1909).

I have studied the *Formicidae* in the Gardens for a number of years, and it seems to me that there are three species (i.e., *Wasmannia auro-punctata*, *Paratrechina (Paratrechina) longicornis*, and *Technomyrmex albipes*) which may be considered as having definitely established themselves, and which may, for classification purposes, be termed as indigenous *Formicidae*, in the same way that *Monomorium pharaonis* L. has been accepted in the British Lists.

I am indebted to Mr. H. Donisthorpe for verifying the ants described above, and for naming the ergatoid male of *Ponera punctatissima* Rog., which was entirely new to me.

II. BRITISH INDIGENOUS FORMICIDAE TAKEN AT KEW GARDENS.

Apart from the Cosmopolitan and Introduced species numbering about 38 mentioned above, a few of the commoner British ants have been observed by myself in the grounds of the Gardens, and not in the hothouses themselves. While this list is not very striking as a locality list, I am not aware that any such record has been published either in the Kew Bulletin or in any entomological journal. These ants are as follows :—

1. *Myrmica laevinodis* Nyl. I have frequently found nests in the less cultivated parts of the Gardens.

2. *Myrmica ruginodis* Nyl. This species has also been observed on one occasion near the Pagoda.

3. *Myrmica scabrinodis* Nyl. Some workers of this species were found walking along a path on May 8th, 1936, but no nest was located.

4. *Leptothorax acervorum* F. This pretty little ant was taken in a hollow, decayed twig in 1933. Winged and fertile females were found, males, workers (c. 20) and larvae. The twig was half-buried in quartz soil, my attention being first attracted by two workers following each other over a sandy mound.

5. *Acanthomyops niger* L. This ant is quite common in the cultivated beds.

6. *Acanthomyops flavus* F. Although I have not found any colonies of this species outside, I have taken a solitary worker in the temperate palm house in 1933.

7. *Acanthomyops alienus* Forst. Some years ago I found a small colony of ants which was supercially like *A. niger* only smaller in size. At the time, I took them to be *niger*, but in all probability they were *alienus*. I have searched for the colony since, but have been unable to find it.

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LVIII—MISCELLANEOUS NOTES.

MR. O. T. FAULKNER, C.M.G.—It was recently announced by the Governing Body of the Imperial College of Tropical Agriculture, that MR. O. T. FAULKNER had been offered and had accepted the post of Principal, which had fallen vacant owing to the retirement of Sir Geoffrey Evans.

Mr. Faulkner has had a distinguished and varied career. After leaving Cambridge in 1912 where he obtained his Degree in Natural Sciences and also took the Diploma in Agriculture, he proceeded to Malaya as Mycologist and Agricultural Expert to the Rubber Growers' Association. Transferring to the Indian Agricultural Service in 1914, he was posted to the Punjab as Deputy Director of Agriculture, and the experience gained in that wide field undoubtedly proved of great value.

In 1921 he left the Indian Service and went over to Nigeria at the time when the northern and southern divisions were being welded into one Territory by Sir Frederick (now Lord) Lugard. Faulkner made a detailed study of the huge area and was very successful in organizing a properly equipped and well staffed

Agricultural Department during his stay of fourteen years. His study of peasant agriculture was particularly noteworthy. He was transferred to Malaya in 1936 as Director of Agriculture, Straits Settlements and Federated Malay States.

Mr. Faulkner brings most of the requisites for the successful conduct of the work of his new post. His wide knowledge of tropical agriculture and his administrative experience should stand him in good stead and we wish him all success in his new office.

Mr. GWILYM ARTHUR JONES, C.M.G., Commissioner of Agriculture at the Imperial College of Tropical Agriculture, has been appointed Director of Science and Agriculture in Jamaica, in place of Mr. A. C. Barney, who has resigned.

Mr. Jones obtained the Diploma in Agriculture at Bangor, and first went out to the West Indies in 1908 where he worked on a sugar estate in Antigua. After a short time he was appointed Science Master at the Antigua Grammar School and from 1909 to 1919 he was Assistant Curator and Chemist in Dominica. He then joined the staff of the St. Madeleine Sugar Company in Trinidad, being in charge of the cane organization and experimental work. In 1929 he joined the staff of the Imperial College of Tropical Agriculture as Assistant Commissioner and became Commissioner in 1933.

In addition to the agricultural work in the Windward and Leeward Colonies for which the Commissioner is responsible, Mr. Jones served on two Royal Commissions—the Olivier Sugar Commission and the commission that enquired last year into the recent Trinidad disturbances. He was created a C.M.G. in June this year.

Mr. C. B. GIBBINS, Assistant Agriculturist at the Coffee Experimental Station, Moshi, Tanganyika Territory, who was formerly a student gardener at Kew, has been appointed Assistant Superintendent of Plantations at the East African Agricultural Research Station, Amami.

Herbarium specimens and gas-poisoning.—For many years it has been the practice at Kew for all dried specimens intended for the Herbarium to be passed through a special poison-gas chamber before being mounted. In this way it was hoped to kill all insects and their eggs which were likely to cause damage to the specimens at a later stage. In addition, the plants receive the normal hand-poisoning with corrosive-sublimate solution.

The gas employed was carbon bisulphide, and it was applied in a special brick-built building near the Herbarium. The method was slow in action, and doubtfully efficacious, and it became increasingly evident that a more positive and quicker process would have to be evolved; the more so because outbreaks of beetle attacks in the Herbarium itself were becoming more frequent.

Consultations with experts, in particular Dr. A. B. P. Page of the Imperial College of Science & Technology, resulted in a decision to use hydrogen-cyanide as a fumigant. So potent a poison necessitated the design of a special piece of apparatus for its application, and a firm of engineers, Messrs. W. Edwards & Co., in consultation with Dr. Page, were instructed to design and make such apparatus.

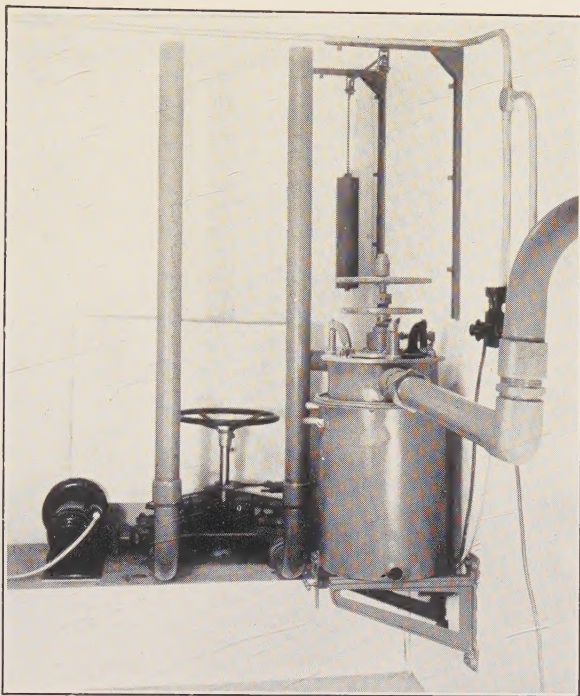
The mechanism, which was installed towards the end of 1937 and is now in full working order, consists of two major parts. The fumigation chamber itself consists of a large steel tank of approximately 200 cubic feet capacity, fitted with a gas-tight steel door. Two trolleys fitted with castors run freely into and out of the chamber and accommodate a large number of wire trays arranged in tiers into which the specimens are placed. Several thousand specimens can be dealt with at one time. (Plate III, *b*.)

The poison gas is passed into the chamber from the gas generating room through various distributing pipes, and a safety device is provided to prevent damage in the event of a sudden increase in pressure. In addition, electric heating elements are present in the chamber, thermostatically controlled, to maintain an even temperature within the chamber of about 65°F.

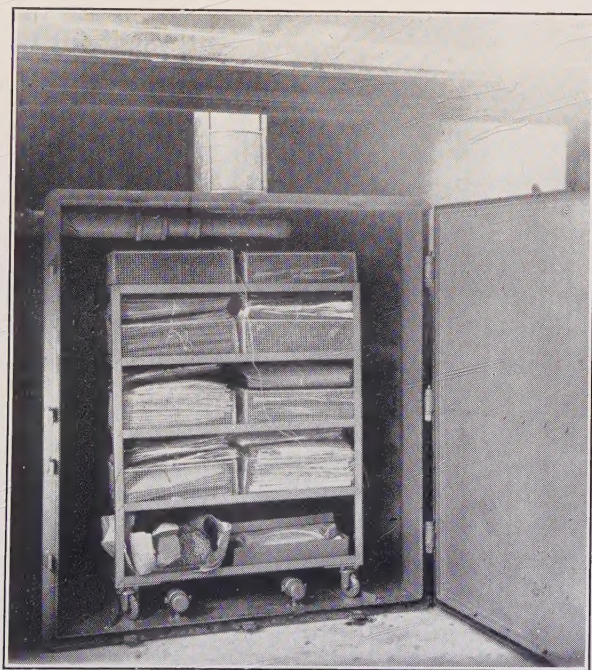
The hydrogen cyanide used in the process is obtained in hermetically sealed cans ("Zyklon"), in which the gas is absorbed in a porous earthy material. Each can contains 400 grammes of the gas, an amount which produces a very high concentration within the gas chamber. The gas is liberated from the tin in a specially designed vaporiser which gives perfect safety to the operator. The can is placed on a platform provided in the vaporiser and the cover is then replaced to render the system gastight. A water jacket is provided which is heated by electric immersion heaters. By mechanical devices operated externally, the lid of the can is removed, the material tipped out of the can and distributed evenly over the floor of the vaporiser. The gas is generated immediately the can is opened, a process which is greatly accelerated when the material strikes the hot surface of the vaporiser. (Plate III, *a*.)

A powerful electric fan drives the gas into the gas chamber and a circulation of the gas through the specimens is maintained for at least two hours. The specimens are then left in contact with the gas for another twenty hours, after which period special valves are opened and fresh air is forced through the apparatus for two hours. The chamber can then be opened with safety, although the specimens are not normally handled until a few more hours have elapsed.

The question of safety to the operator has been a major consideration in the design of the apparatus and various safety locks have been fitted to ensure that a correct sequence of operations is followed. No precautions are necessary other than those incorporated in the equipment itself. In the unlikely event of a leak occurring in the gas generating room during the initial cutting of the



(a) Generating Room.



(b) Fumigation Chamber.

can or even subsequently, a Siebe-Gorman oxygen apparatus has been obtained to afford assistance in rescue work.

The total cost of the equipment has been nearly £370, while the cost of the fumigant itself per thousand specimens works out at a figure between 1s. 6d. and 3s., depending largely on the relative proportions of mounted and unmounted material. F. BALLARD.

Botanical Magazine.—The second part of vol. 161 was published on 5th August, 1938, and contains the following plant portraits :—

Rhododendron diaprepes Balf. f. et W. W. Smith (t. 9524) from S.W. Yunnan and N.E. Burma ; *Sarcocapnos enneaphylla* (L.) DC. (t. 9525), allied to *Fumaria* and *Corydalis*, a native of southern France and Spain ; *Berberis linearifolia* Philippi (t. 9526), a fine barberry introduced by H. F. Comber from the Andes of Chile and Argentina ; *Primula sonchifolia* Franchet (t. 9527), discovered by Delavay in 1884 and found later by Forrest ; living plants were sent home in the resting stage, having been collected by Forest Ranger Sukoe on the Hpimaw Pass : the plant is a native of W. China, Tibet and N.W. Burma ; *Cytisus Battandieri* Maire (t. 9528), figured from the plant long grown in the open at Kew, a native of Morocco ; *Anoectochilus Roxburghii* (Wall.) Lindley (t. 9529), found in the Himalayas and Assam to S. China ; *Notospartium glabrescens* Petrie (t. 9530), from New Zealand ; *Canarina Eminii* Ascherson ex Schweinfurth (t. 9531), a native of Eastern Africa from Abyssinia to the mountains north of Lake Nyasa ; *Deutzia longifolia* Franchet var. *Farreri* Airy Shaw (t. 9532), a newly-described variety discovered by Potanin in Eastern Kansu, W. China ; *Nomocharis aperta* (Franchet) E. H. Wilson (t. 9533), native of N.W. Yunnan and S.W. Szechwan ; and *Rubus tricolor* Focke (t. 9534), a very distinct species discovered by Delavay in Yunnan and found also in Szechwan.

Callicarpa subpubescens Hook. et Arn.—As stated by Hooker and Arnott in Bot. Beechey Voy. 275 (1839–40), the localities of the Mexican plants listed were sometimes doubtful, as the same species was sometimes also found in packets of plants from Bonin and Loo Choo, in the North Pacific. That a wrong locality was given seems to be established beyond doubt in the case of *Callicarpa subpubescens* (op. cit. 305), which was said to come from Tepic. The Beechey specimens in Herb. Hook. and Herb. Benth. have the locality Bonin written by Benthham himself, and were transferred, apparently by the late Dr. Stapf, to their proper places in the Kew Herbarium, and identified with other Bonin specimens. The species was listed as somewhat doubtfully Mexican by Standley on page 1253 of his "Trees and Shrubs of Mexico."

A. A. BULLOCK and C. V. B. MARQUAND.

Works on Diatoms.—An Index to Localities of Diatoms, compiled by Miss Alice M. Mainland, has been presented to the Bentham-Moxon Trustees by Mr. Frederick Adams. It will be added to the two collections of works on this group already presented by Mr. Adams (K.B. 1932, 250, and 1936, 110), and will therefore be available to responsible workers on the *Diatomaceae* who wish to borrow it.

Flora of the City of Madras.*—This is a supplement to the "Flora of Madras City" published in the same Bulletin in 1929 (reviewed in K.B. 1929, 271). It is the fruit of intensive observation and research in the area by Professor E. Barnes. It adds 2 families, 16 genera and 50 species with a few varieties to the list given in the previous work. The first nine pages give a detailed list of the additions with notes for distinguishing them from those previously described and in several cases keys to facilitate the identification of the genus or species are added. The second part furnishes descriptions of the families, genera and species. Finally there are seven plates of black and white drawings depicting 24 of these species. The whole is well got up and provides a useful supplement to those interested in the flora of the area. C. E. C. FISCHER.

Seventh International Botanical Congress, Stockholm, 1940.—We have been asked to publish the following notice:—

Motions dealing with Nomenclature for consideration by the VIIth International Botanical Congress, Stockholm, 1940, should be sent before July 1, 1939, to the Rapporteur général, Dr. T. A. Sprague, The Herbarium, Royal Botanic Gardens, Kew, Surrey, England.

Motions must be presented in the form of additional articles (or amendments) to the International Rules. They should be drafted as briefly as possible. At least 100 printed copies must be presented.

* Supplement to the "Flowering Plants of Madras City and its Immediate Neighbourhood," by E. Barnes, B.Sc. Bulletin of the Madras Government Museum. New Series.—Natural History Section, vol. 4, no. 2, 1938. Printed by the Superintendent, Government Press, Madras, 4to. Pp. 46, pl. 10, paper. Price *Re* 1-10-0.

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